

STRUCTURE OF THIS MICROCARD (BASIC INSTRUCTIONS)

A02 = How to use this microcard		1	2	3		4
A01 = Structure of microcard					SIS	
B01 = Trouble-shooting chart	-A-	***X*	X*XXX	XXXXX	XXXXX	*XXXX X
	-B-	*XXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	-C-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	-D-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	-E-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XX
	-F-	XXXXX	XXXXX	XXXXX	XXX	
	-G-	XXXXX	XXXXX	XXXX		
	-H-					
	-J-					
	-K-					
	-L-					
	-M-					
N01 = Service information	-N-	*XXXX	XXXXX	XXXXX	XXX	*X XX*
		12345	67890	12345	67890	12345 678
			1		2	
						Index

N28 = Table of contents and publication information

- 1 = Special features
2 = Safety and precautionary measures
3 = Testers and tools
4 = Installation position of components

- a. Read from left to right.
b. Title of micropicture (appears on each micropicture).

E16	Product/component/test step	
	Coordinate	

c. Limits of section

<u>=></u>	<u><=></u>	<u><==</u>	<u>=> <=</u>
Beginning	Mid-section	End	One-page section
A01			=> <=

HOW TO USE THE MICROCARD

Trouble-shooting instructions for system:

KE 3.2-Jetronic

Descriptions, photos, terminal designations and special features refer to the vehicle:

AUDI 100 / engine NF / 2.3 l / 5-cylinder
Date of manufacture 08.86.->

These basic instructions are detailed trouble-shooting instructions. They must not be used as vehicle-specific instructions.

C a u t i o n !
Descriptions and photos may differ from the vehicle-specific brief instructions.

Binding set values, terminal assignments and special features should be taken from the vehicle-specific brief instructions only.

For brief instructions, see table-of-contents microcard KFZ-00..

A02		=> <=
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SPECIAL FEATURES

- * KE-Jetronic system version 3.2 with self-diagnosis and flashing-code output
- * Diagnosis of final control elements
- * Tank ventilation with pulsed valve
- * Lambda closed-loop control
- * In-tank electric fuel pump
- * Electronic ignition with knock control, self diagnosis and flashing-code output

SPECIAL FEATURES (CONTINUED)

KE control unit and EI-K control unit

Both control units are electrically connected to each other. The component, altitude sensor, idle switch, full-load switch, and diagnostic lamp pass on information to both control units. When reading out the self-diagnosis, pay attention to in which indication mode the fault codes appear. After activation of the self-diagnosis, the stored faults of the EI-K control unit are output first, then followed by the stored faults of the KE control unit.

Final-controlling-element diagnosis

The KE control unit has a final-controlling-element diagnosis facility with which the components, pressure actuator, tank-vent valve, idle actuator, and cold-start valve, can be tested electrically and mechanically with regard to proper functioning.

SPECIAL FEATURES (CONTINUED)

Tank-ventilation system

The fuel vapors which develop in the fuel tank are accumulated in the activated-carbon filter. When the engine is running, it inducts these fuel vapors out of the filter. A pulsed tank-vent valve, which is installed between the activated-carbon filter and inlet manifold, proportions the amount of fuel vapors fed.

Depending upon the operating condition of the engine, the KE-Jetronic control unit controls the opening cross-section in the tank-vent valve via the on/off ratio. In this way, too severe a change in mixture is avoided.

The tank-vent valve is open when it is de-energized when the ignition is switched off.

In order to prevent running on (dieseling), the tank-vent valve drops out after a delay when the ignition is switched off.

SAFETY AND PRECAUTIONARY MEASURES

Always observe safety and precautionary measures in order to avoid hazards to persons and damage to the engine, the trigger box and control unit, and the ignition system.

CAUTION!

High-performance ignition system with dangerous high and low voltages!

Contact with voltage-carrying parts or terminals can be fatal (on both primary and secondary sides).

For testing of compressions pressure, disconnect pump relay in order to prevent undesired injecting of the injection valves.

Do not short-circuit ignition coil term. 1 to ground (e.g. for switching off the engine). Ignition coil and possibly control unit will be destroyed.

Never connect positive pole of battery to ignition coil term. 1. Control unit will be destroyed.

If installing an alarm system, follow installation instructions for L-Jetronic vehicles or microcard KFZ-00.. Make sure that the alarm relay is not disturbed by external fields (e.g. from ignition leads), thus incorrectly triggering.

SAFETY AND PRECAUTIONARY MEASURES
(continued)

Never start engine without battery being firmly connected (battery terminals bolted tight).
Do not disconnect battery from the vehicle electrical system with the engine running.

Do not use a fast charger for starting the engine.

Render starting assistance only with a second 12 V battery and jumper cables.

Caution! Due to non-uniform requirements placed by vehicle manufacturers on electronic products, we do not recommend the use of 24 V batteries for starting assistance.

When charging the battery in the vehicle or rendering starting assistance, observe the directions given in the operating instructions of the fast charger as well as those provided by the vehicle manufacturer.

Prior to charging or fast-charging the battery, disconnect it from the vehicle electrical system.

Incorrect polarity of the supply voltage, e.g. due to incorrect connection of the battery or ignition coil, can lead to irreparable damage to a control unit.

Do not connect or disconnect the wiring harness from control units or trigger-box with the ignition switched on.

Prior to exposure to temperatures above +80°C (paint-dry installation) remove control units.

Control units must be removed before electric spot welding.

SAFETY AND PRECAUTIONARY MEASURES
(CONTINUED)

Important information for when working on the KE-Jetronic.

If any fuel connections are loosened, components removed, even on the vacuum system, be sure to use new seals when re-connecting or when re-installing.

Ensure utmost cleanliness when working on the KE-Jetronic. Clean outside of fuel connections thoroughly before loosening.

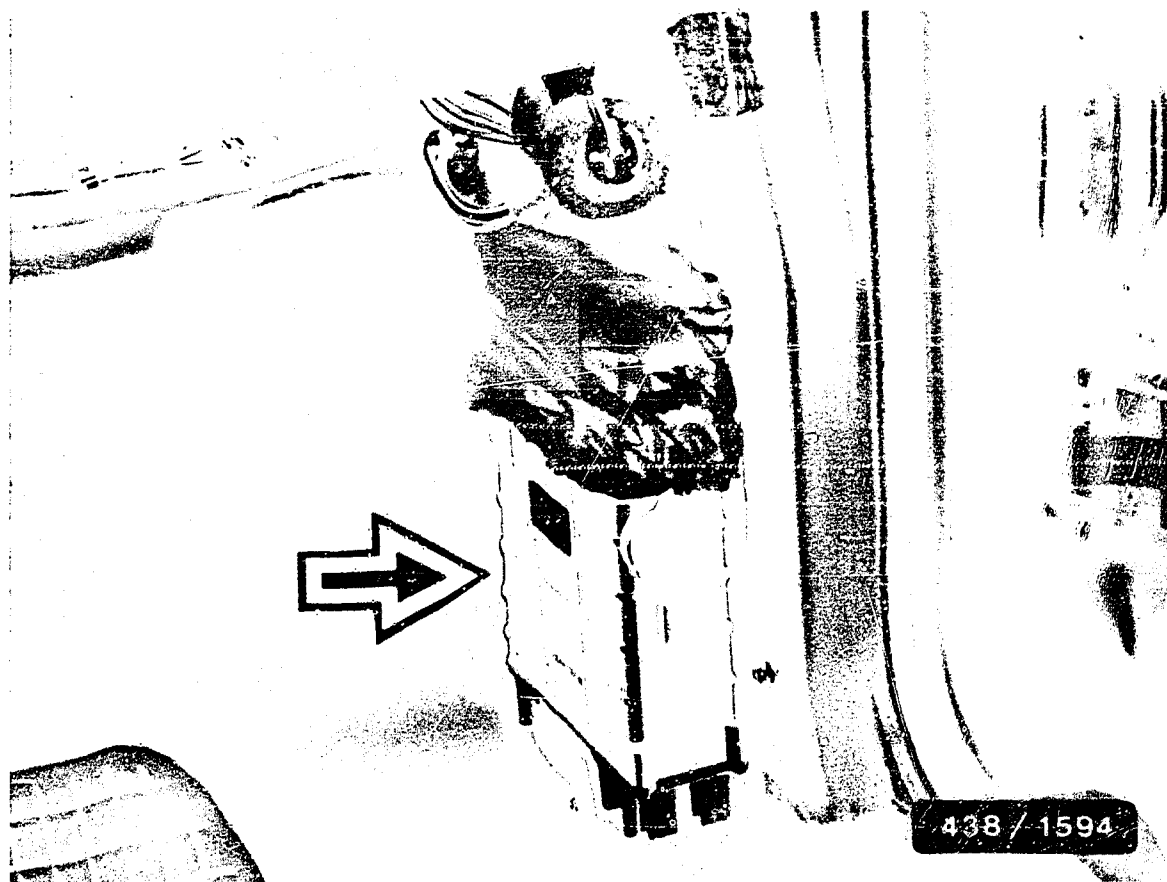
When carrying out testing with the electric fuel pump operating, never deflect (raise) the air-flow sensor plate, because fuel will be injected through the injection valves. During subsequent cranking of the engine, this may lead to serious engine damage.

TEST EQUIPMENT AND TOOLS

Description	Part no.
Motortester e. g. MOT 201 MOT 300 MOT 400	0 684 000 201 0 684 000 300 0 684 000 400
Exhaust-gas e. g. Ett 008.02 analyzer Ett 008.03	0 684 100 802 0 684 100 803
Multimeter (internal resistance min. 20 k Ω /V)	commercially avail. e. Bg Metrawatt GmbH Type MA2H or Fluke Multimeter 75
Pressure tester for testing all fuel pressures and for leak test on system.	KDJE-P 100
Connecting-parts sets	KDJE-P 100/10 KDJE-P 100/11
Valve tester for testing injection valves. Test fuel Bosch order designation Bosch white spirit can be obtained in 5-liter cans from: Oskar Gnam & Co D-7531 Kämpfelbach-Bilfingen	KDJE-P 400 white spirit VS 14 942-CH
Tester for delivered-quantity comparison. For comparative measurement of fuel deliveries from the individual out- lets of the fuel distributor.	KDJE-P 200

TEST EQUIPMENT AND TOOLS (CONTINUED)

Description	Part no.
5 adapter sleeves for connection of tester for delivered-quantity comparison to injection valves with air-shroud sleeves.	KDJE-P 200/19
5 adapter lines	KDJE-P 200/25
Adjusting wrench for exhaust-gas adjustment.	KDEP 1035
Measuring glass approx. 1.5 liter capacity For measurement of fuel delivery of electric fuel pump.	commercially avail.
4 test leads (2 packs) for connection of multimeter to components and plugs.	KDZS 0004
4 test leads (2 packs) for connection of multimeter to components and plugs.	KDUM 0008
1 graduated disk for adjusting full-load throttle- switch.	KDJE 7462
Mounting paste VS 14016 Ft for mounting lambda sensor.	5 964 080 112
1 battery 1.5 V (monocell) for simulation of lambda-sensor voltage.	commercially avail- able



INSTALLATION POSTION OF COMPONENTS

The KE control unit is in the front-passenger footwell.

The control unit is accessible after removing the shelf and the cover.

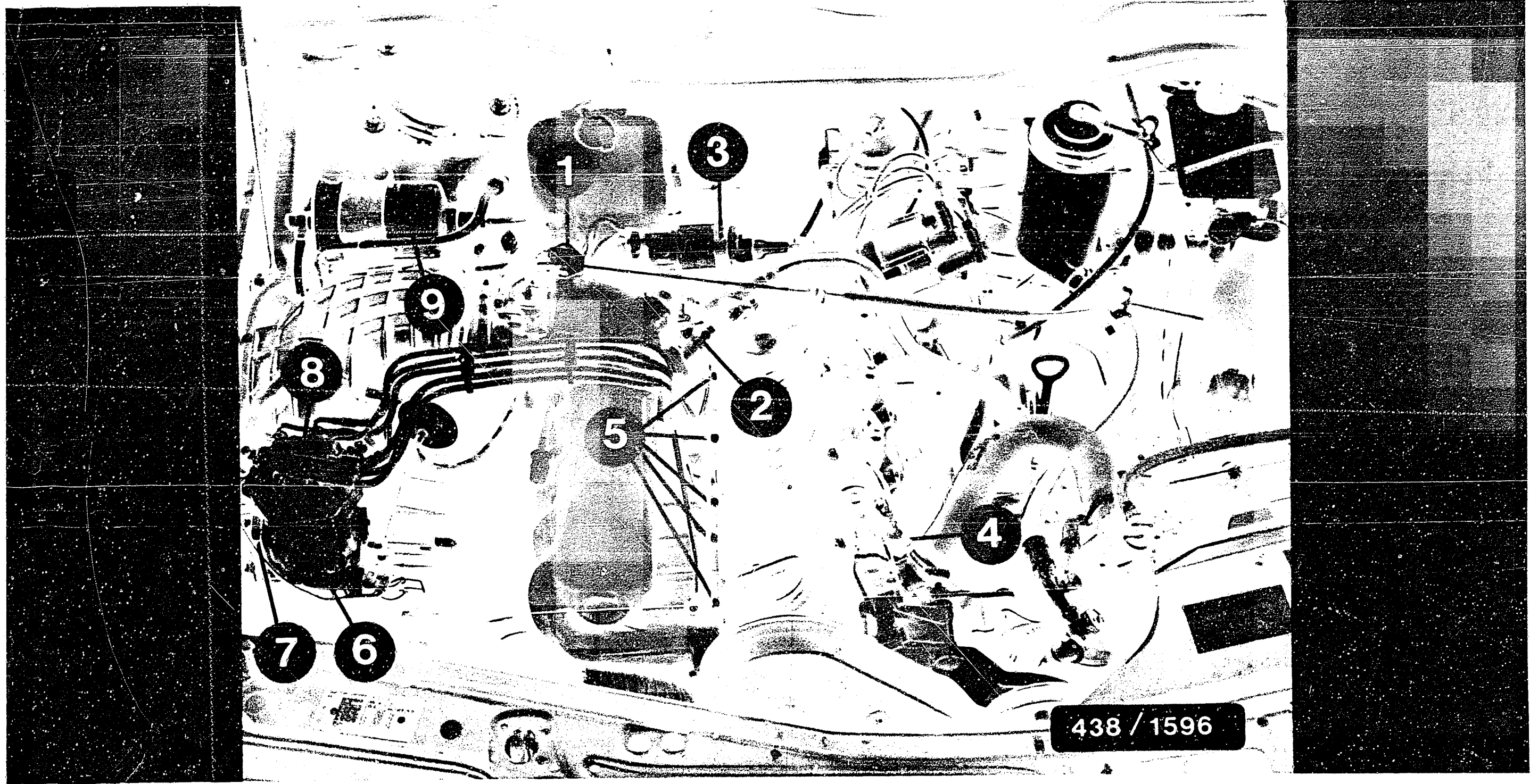


INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The EI-K control unit is in the driver-side footwell. Item 1.

The altitude sensor is above the EI-K control unit. Item 2..

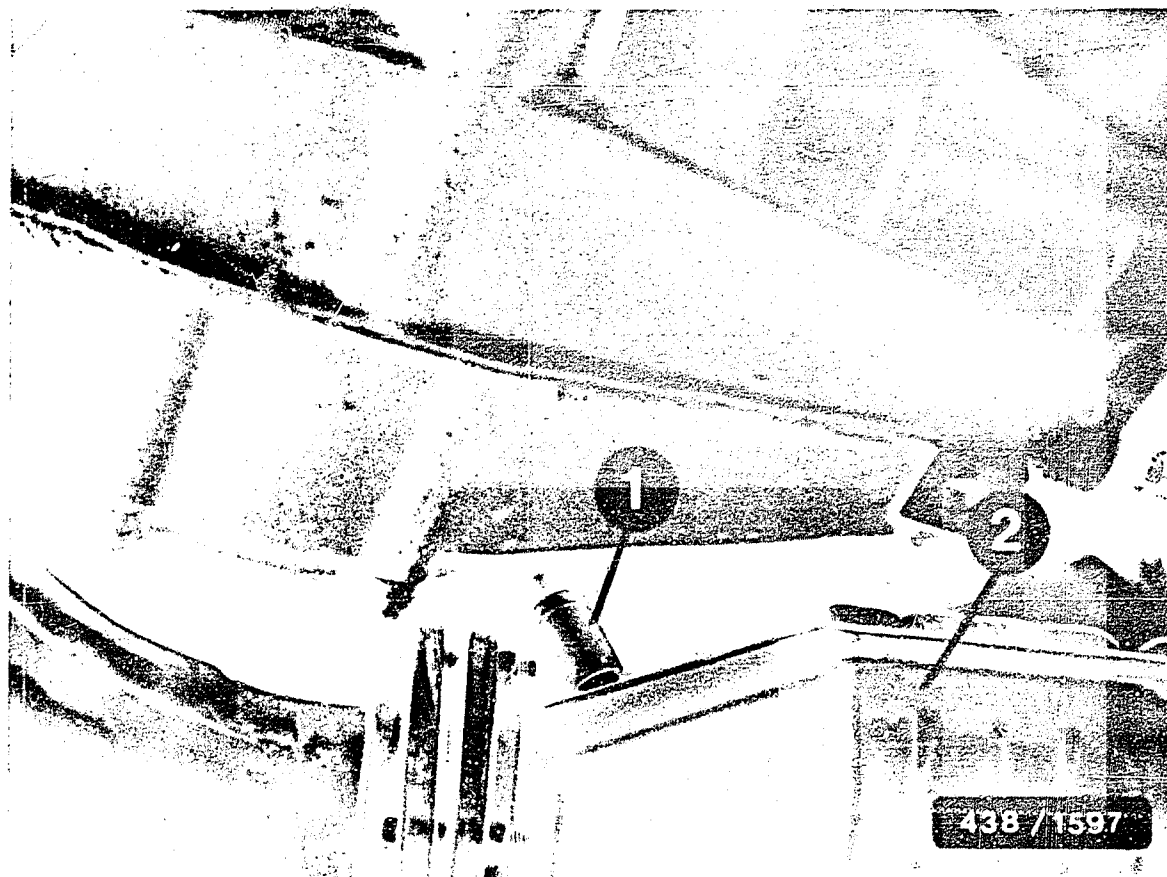
The components are accessible after removing the shelf, the engine-compartment-lid release and the cover.



- 1 = Full-load throttle-valve switch.
The idle throttle-valve switch
(not visible in illustration) is located
on the underside of the throttle-valve assembly.
- 2 = Cold-start valve
- 3 = Idle actuator

- 4 = Temperature sensor (coolant)
- 5 = Injection valves
- 6 = Pressure actuator
- 7 = Potentiometer on air-flow sensor
- 8 = Fuel distributor
- 9 = Fuel filter

INSTALLATION POSITION OF COMPONENTS

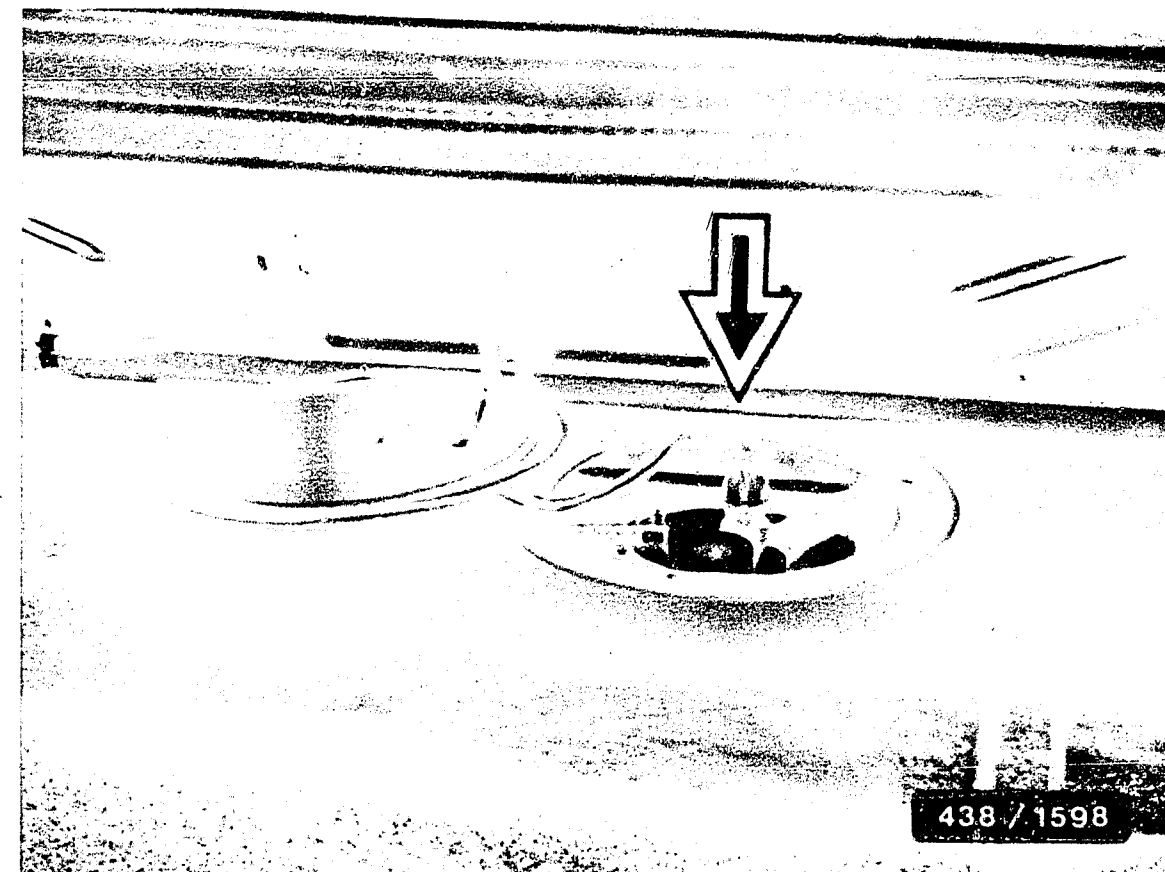


- 1 = Lambda sensor
- 2 = Catalytic converter

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

N o t e :

Before installing a new sensor, coat its thread with special mounting paste VS 14 016 Ft (5 964 080 112). Make sure that only the threads are coated and that no paste gets into the slots of the protective sleeve.



INSTALLATION POSITION OF COMPONENTS (CONTINUED)

In-tank electric fuel pump, accessible from luggage compartment.

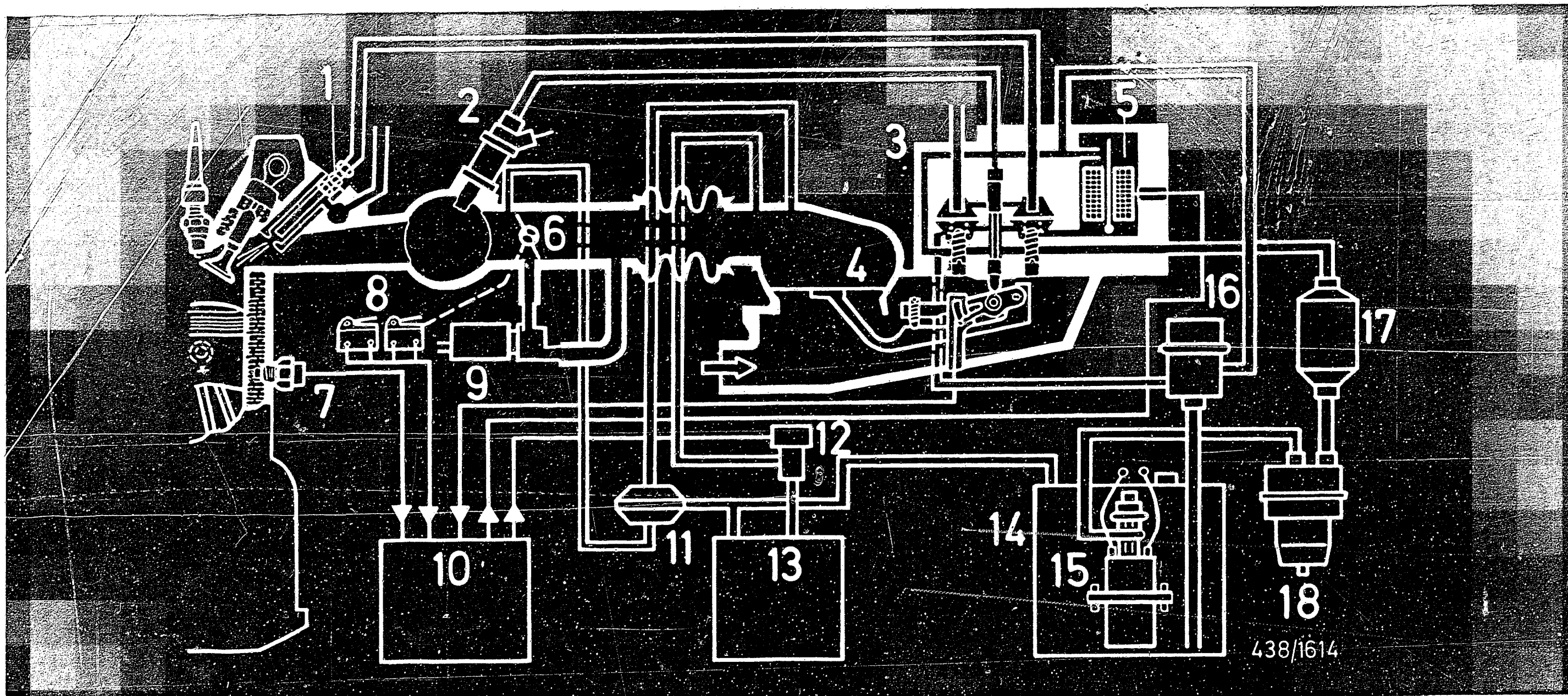
INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The fuel accumulator is on the underside of the vehicle between rear axle and fuel tank.

The pressure regulator is next to the mixture-control unit in the right-hand wheel house.

The active-carbon filter with the tank-ventilation valve is installed next to the mixture-control unit in the right-hand wheel house.

For production reasons:
continued on the following
coordinate.



- | | | |
|----------------------------------|---|---|
| 1 = Injection valve | 8 = Throttle-valve switch, idle/
full-load | 14 = Fuel tank |
| 2 = Start valve | 9 = Idle actuator | 15 = Electric fuel pump |
| 3 = Fuel distributor | 10 = Control unit | 16 = Pressure regulator
(primary pressure) |
| 4 = Air-flow sensor | 11 = Valve for active-carbon filter | 17 = Fuel filter |
| 5 = Pressure actuator | 12 = Tank-ventilation valve | 18 = Fuel accumulator |
| 6 = Throttle valve | 13 = Active-carbon filter | |
| 7 = Temperature sensor (coolant) | | |

DIAGRAM OF FUEL LINES AND AIR ROUTING IN

HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM

The TROUBLE-SHOOTING CHART starts on Coordinate B3 and contains customer complaints (fault symptoms) with several possible causes of the trouble (component faults) in each case as well as coordinate references for detailed trouble-shooting. If no coordinate reference is given, this is a cause for which test instructions are not required.

Functions/components which are tested via the self-diagnosis are listed in the trouble-shooting chart only if necessary.

If the customer complaint is clear, proceed with trouble-shooting in the given order of possible causes, one after the other and step by step.

Trouble-shooting should always start with the self-diagnosis. Only then continue with the trouble-shooting chart.

If the customer complaint is not clear, check all the causes given in the trouble-shooting chart. To prevent possible incorrect measurements, check all causes in the order given (because of the interlinking of test steps).

HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM (CONTINUED)

The TROUBLE-SHOOTING PROGRAM contains all system and component checks mentioned in the trouble-shooting chart. It is divided into three rows of boxes.

The left-hand column contains test instructions and set values.

The center column contains instructions on trouble-shooting and fault rectification.

The right-hand column contains the illustrations/terminal diagrams belonging to the text, with explanations.

If the questions in the left-hand column can be answered clearly with "yes", continue trouble-shooting with the next box down.

If the answer to the question is "no", branch to the center column and carry out the tests in the order given there.

After the fault has been rectified, repeat the task as a check.

TEST CONDITIONS:

- Battery fully charged
- Engine mechanically O.K.
(e.g. compression, valve clearance etc.)
- Engine at operating temperature approx. +80°C if necessary)
- All connectors of wiring harness correctly seated

TROUBLE-SHOOTING CHART

Customer complaint (fault symptom)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

Cause (component fault)											Coord.
*	*	*	*	*	*	*	*	*	*	*	Self-diagnosis B07
*	*	*	*	*	*	*	*	*	*	*	Pressure actuator D21
	*										Tank-ventilation valve D25
	*										Idle actuator E01
*	*				*						Start valve E05
*	*	*	*	*							Air-intake system E09
*	*	*	*			*					Air-flow sensor E11
*						*					Air-flow sensor plate E17
*	*			*	*						Electric fuel pump E25
*	*			*	*						Primary pressure F05
*	*	*	*	*	*	*					Differential pressure F09
*											Fuel system leaking F23
*	*	*	*	*	*	*					Injection valve G07
*	*	*	*		*	*					Fuel distributor G19

B03

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TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptom)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

Cause (component fault)											Coord.
*	*			*							Throttle valve B21
*	*	*	*	*			*	*			Control-unit power supply C21
*	*	*	*	*	*	*					Temperature sensor (coolant) C19
	*	*									Idle throttle-valve switch F13
				*		*	*				Full-load throttle-valve switch B19
		*	*	*							Lambda closed-loop control H19
*	*	*	*			*					Exhaust-gas adjustment H11
		*									Idle control H11
*											Starting enrichment H05
*	*										Post-start enrichment H05
*	*	*	*								Warm-up enrichment H07
		*									Acceleration enrichment H07
		*	*								Full-load enrichment H09
				*							Overrun cutoff H09

B04

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HOW TO USE SELF-DIAGNOSIS, SELF-DIAGNOSIS
TEST TABLE AND TROUBLE-SHOOTING PROGRAM

This vehicle is equipped with a control unit which has a self-diagnosis feature. Therefore, start trouble-shooting with the self-diagnosis.

How to activate the self-diagnosis is described starting on Coordinate B07 .

The self-diagnosis test table starting on Coordinate B11 contains:

- Fault indication (flashing code)
- Components or system functions under test.
- Test instructions/test conditions
- Connection terminals
- Set-value specifications
- Coordinate references for trouble-shooting and fault rectification in the subsequent self-diagnosis trouble-shooting program

The self-diagnosis trouble-shooting program starting on Coordinate B17 is divided into 3 columns.

The left-hand column contains test instructions and set values.

The center column contains instructions on trouble-shooting and fault rectification.

The right-hand column contains the illustrations/terminal diagrams belonging to the text, with explanations.

HOW TO USE SELF-DIAGNOSIS, SELF-DIAGNOSIS
TEST TABLE AND TROUBLE-SHOOTING PROGRAM
(CONTINUED)

If the questions in the left-hand column can be answered clearly with "yes", continue trouble-shooting with the next box down.

If the answer to the question is "no", branch to the center column and carry out the tests in the order given there.

After the fault has been rectified, repeat the test as a check.
If the self-diagnosis indicates a fault, but no system or component fault has been found during trouble-shooting, try replacing the control unit.

After activation, the faults stored for the EI-K control unit are output first, with the faults stored for the KE control unit being indicated afterwards.

If the fault codes 2121, 2123 or 2223 are indicated only during the fault-code output for one control unit, first of all check the corresponding leads to the respective control unit for open circuit or loose contact.

If the self-diagnosis no longer indicates a fault and the customer complaint (fault symptom) has still not been rectified, continue trouble-shooting with the trouble-shooting chart starting on Coordinate B03 .

HOW TO ACTIVATE THE SELF-DIAGNOSIS

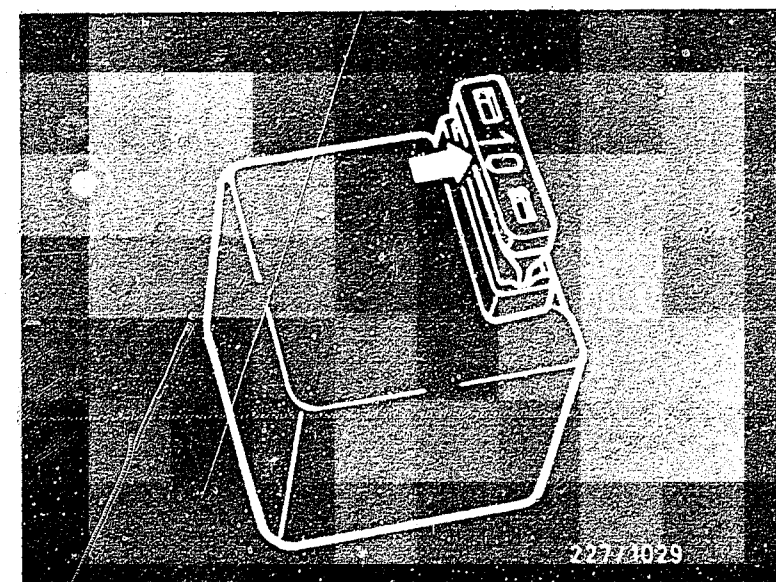
To allow the control units to detect any faults, a 5-minute road test must be conducted before activating these self-diagnosis. The engine speed must exceed 3000 min⁻¹ at least once during this road test. After the road test, the engine must not be switched off. The self-diagnosis is then activated with the engine running.

If the engine will not start, it must be cranked for at least 6 seconds to enable the KE control unit to detect any faults. The ignition must not be switched off after cranking. Then activate the self-diagnosis.

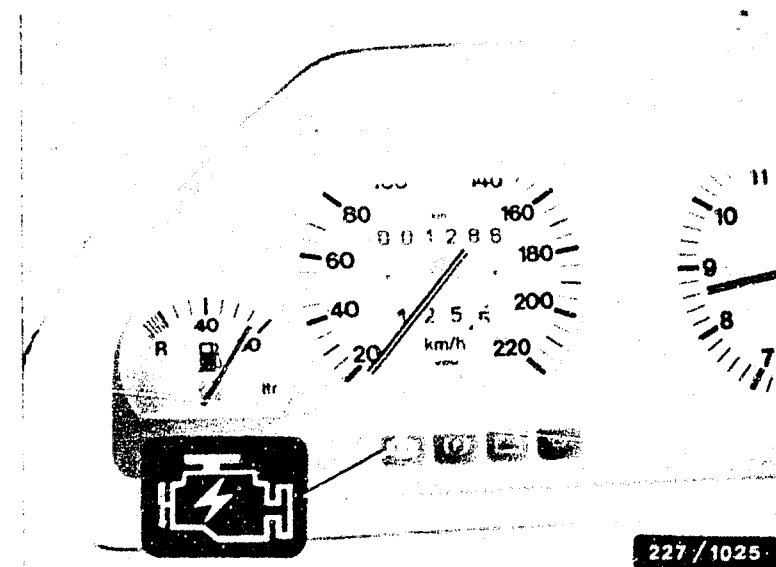
The fault memory is erased by switching off the ignition.

To activate the self-diagnosis, the contacts on the electric-fuel-pump relay must be jumped for at least 4 seconds.

The flashing code is output in the instrument panel by the indicator lamp with the engine symbol.



Arrow = Electric-fuel-pump
relay jumped with
fuse



HOW TO ACTIVATE THE SELF-DIAGNOSIS (CONTINUED)

After the self-diagnosis has been activated, the EI-K control unit is interrogated first of all. The output of faults starts with a 2.5-second-long pulse. There follows a pause of the same duration. Then comes the flashing code in 4 flashing-pulse groups each of up to 4 flashing pulses. The fault code is repeated until the contacts on the electric-fuel-pump relay are again jumped for at least 4 seconds. There is a 2.5-second-long flashing pulse as a separation between repeats.

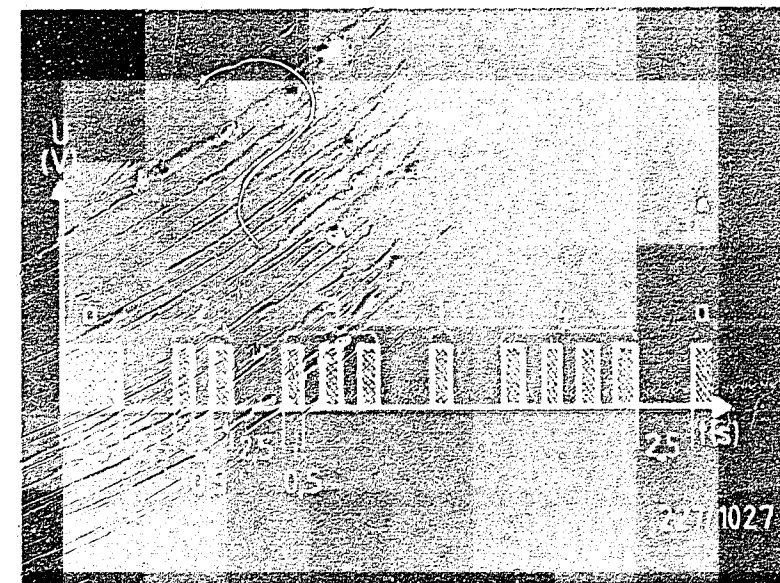
After all faults have been output from the EI-K control unit, the flashing code "0 0 0 0" appears. The diagnosis lamp flashes at 2.5-second intervals.

After the contacts have been jumped again, the fault memory for the KE control unit is output. Should the engine be running, there will be a clear increase in idle speed.

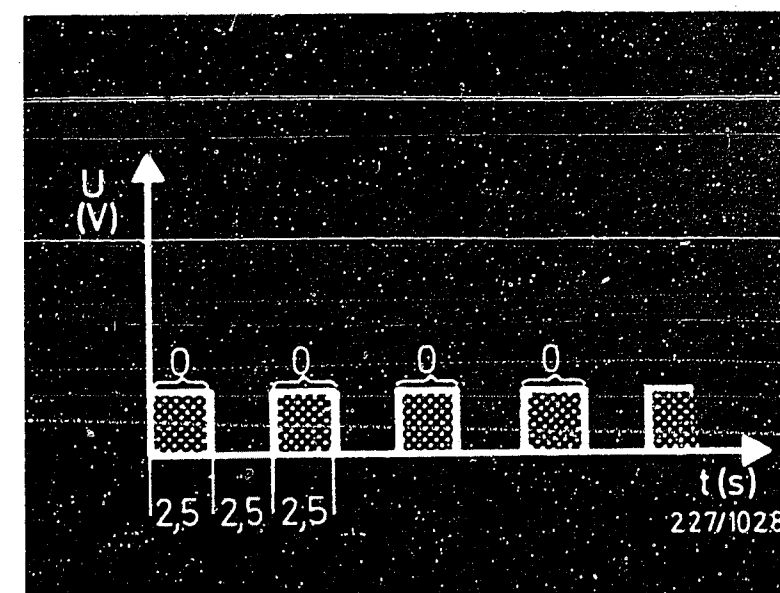
When no more faults are stored in the KE control unit, after the contacts have been jumped once again, the flashing code "0 0 0 0" likewise appears.

The end of the self-diagnosis is reached by jumping the contacts once again, by briefly raising the engine speed above 2500 min^{-1} or by switching off the ignition.

Before the control units can again store faults, the fault memories must be erased by switching off the ignition.



Note:
Shaded area means fault lamp ON.
a = Starting signal (start of transmission of flashing code)



SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Testing of component/function	Test instructions/ Test conditions	Termi- nals	Set values	Coord.
1 1 1 1	Control units	Pay attention to whether fault-code output applies to EI-K or KE! EI-K control unit or KE control unit defective.			
2 1 2 1	Idle throttle-valve switch and/or lead defective	Pay attention to whether fault-code output applies to EI-K or KE! Idle throttle-valve switch constantly closed. Lead to terminal 28 has short circuit to positive. Incorrect adjustment. Throttle valve closed: Throttle valve open: Test adjustment:	KE 28 EI-K 7	0 Ω infinity Ω 0.6 mm	
2 1 2 2	No engine-speed signal from ignition system	Break in lead from KE control unit terminal 30 to EI-K control unit terminal 17. Test continuity in lead: Check ignition system:	KE 30 EI-K 17	0 Ω see SIS	
2 1 2 3	Full-load throttle-valve switch and/or lead defective	Pay attention to whether fault-code output applies to EI-K or KE! Full-load throttle-valve switch constantly closed. Lead to terminal 28 has short circuit to positive. Incorrect adjustment. Throttle valve closed: Throttle valve open: Test adjustment:	KE 31 EI-K 9	infinity Ω 0 Ω 68...76°	
2 1 4 1	Knock control at control stop	Check ignition system:		see SIS	
2 1 4 2	Knock sensor and/or lead defective	Check ignition system:	—	see SIS	

SELF DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Component/function under test	Test instructions/ Test conditions	Terminals	Set values	Coord.
2 2 2 3	Altitude sensor/lead defective	Note whether fault-code output is for EI-K or KE! Check power supply to altitude sensor at terminals 2 and 3. Check voltage signal at terminals 1 and 3. Open circuit in lead. Check lead for continuity:	KE 25, 26,35 EI-K 2	see brief instructions 0 Ω	C05
2 2 3 2	Potentiometer on air-flow sensor/lead defective	Check power supply to potentiometer at terminals 1 and 3. Check voltage signal at terminals 1 and 2. Open circuit in lead. Check lead for continuity:	KE 23, 26,35	see brief instructions 0 Ω	C09
2 2 3 3	Reference voltage for load and altitude signals for EI-K control unit	Open circuit in lead from KE control unit terminal 26 to EI-K control unit terminal 21. Check lead for continuity:	KE 26 EI-K 21	0 Ω	C13
2 3 1 2	Temperature sensor (coolant)/lead defective (double NTC, one connection for KE-Jetronic)	Note whether fault-code output is for EI-K or KE! Open circuit/short circuit to ground in lead from KE control unit terminal 3 to temperature sensor (coolant). Check lead for continuity: Check leads for short circuit to ground: Resistance of temperature sensor (coolant) * Engine cold (+15°C...+30°C) * Engine at operating temp. (approx. +80°C)	KE 3	0 Ω infinity Ω 1300...3600 Ω 250... 390 Ω	C19
2 3 4 2	Lambda sensor/lead defective	Open circuit, short circuit to ground or to battery voltage in lead from KE control unit terminal 7 to lambda sensor. Check lead for continuity: Check leads for short circuit to ground and battery voltage: Watch for worn insulation! Sensor heating defective. Sensor clogged.	KE 7	0 Ω infinity Ω	C23

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Testing of component/function	Test instructions/ Test conditions	Termi- nals	Set values	Coord.
4 3 4 1	Pressure actuator and/or lead defective	Test resistance of pressure actuator: Test continuity in lead:	KE 4.5	16...22 Ω 0 Ω	
4 3 4 3	Tank-vent valve and/or lead defective	Break in lead from KE control unit terminal 15 to tank-vent valve, or short circuit to ground. Voltage supply (ignition, terminal 15) to tank-valve interrupted. Test continuity in lead: Test short circuit in leads to ground:	KE 15	Battery voltage 0 Ω infinity Ω	
4 4 3 1	Idle actuator and/or lead defective	Break in lead from KE control unit terminal 17 to idle actuator, or short circuit to ground. Voltage supply (ignition, terminal 15) to idle actuator interrupted. Test continuity in lead: Test short circuit in leads to ground:	KE 17	Battery voltage 0 Ω infinity Ω	
4 4 4 3	Cold-start valve and/or lead defective	Break in lead from KE control unit terminal 16 to cold-start valve, or short circuit to ground. Voltage supply (ignition, terminal 15) to cold-start valve interrupted. Test continuity in lead: Test short circuit in leads to ground:	KE 16	Battery voltage 0 Ω infinity Ω	
4 4 4 4	When no fault present				
0 0 0 0	End of fault output				

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (1)

SELF-DIAGNOSIS FLASHING CODE 1111

Note whether fault-code output is
for EI-K or KE!

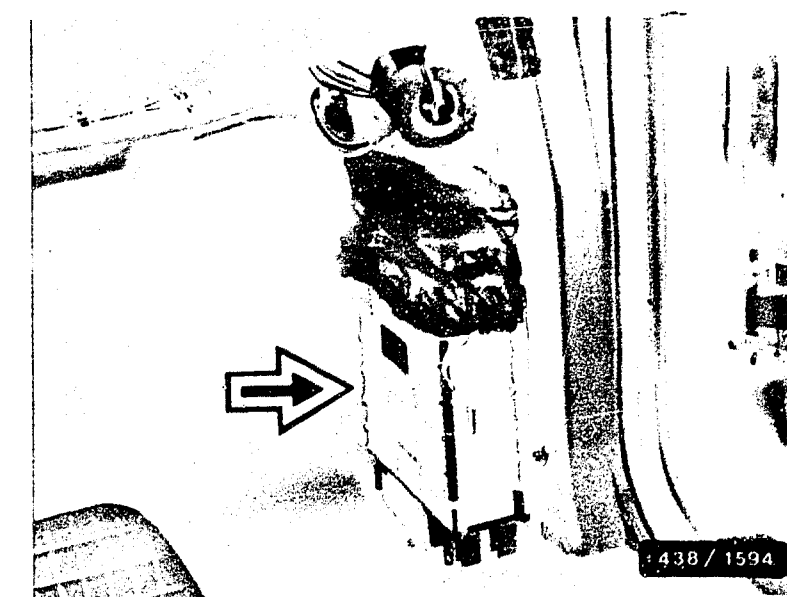
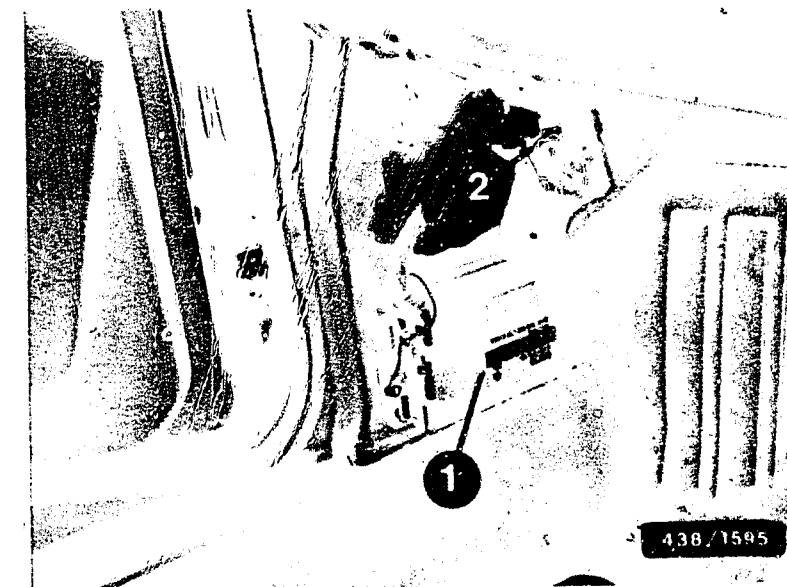
EI-K control unit or
KE control unit defective.

No flashing code?

N>

Replace control unit
concerned.

(Top picture - EI-K control unit)
(Bottom picture - KE control unit)



Return to self-diagnosis
test table B11

B17

B18

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (2)

SELF-DIAGNOSIS FLASHING CODE 2121

Note whether fault-code output is for, EI-K or KE!

Idle throttle-valve switch not opening or short circuit in leads.

Check idle throttle-valve with ohmmeter:

Measure resistance values directly at the pins of the switch.

Set values:
Throttle valve closed
0 Ω
Throttle-valve open
infinity Ω

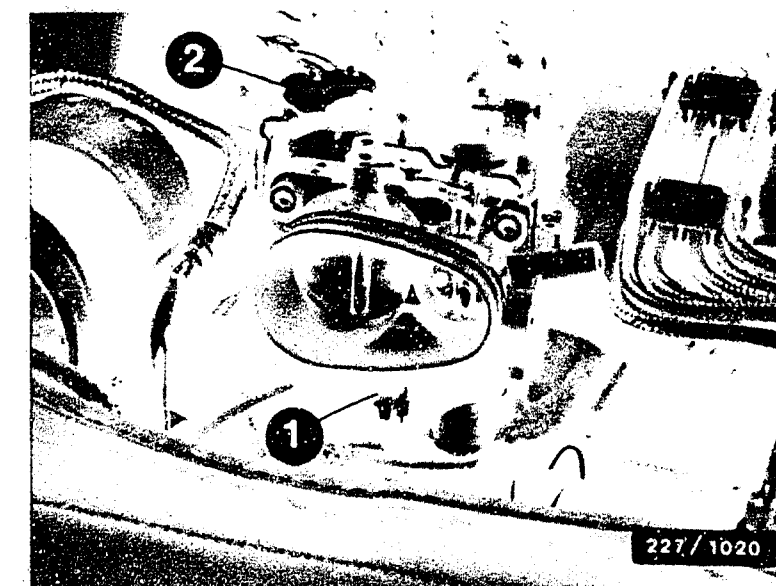
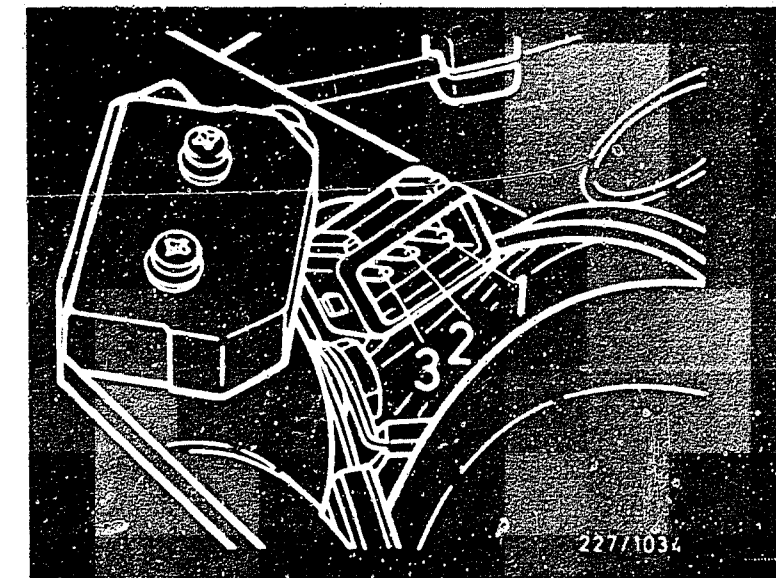
Set values obtained?

N>

Replace and adjust idle throttle-valve switch or re-adjust.

If a defect is found on one throttle-valve switch, it is always necessary to replace and re-adjust both switches.

- * Remove throttle-valve part.
- * Connect ohmmeter to idle throttle-valve switch.
- * Loosen fastening screws of switch and adjust switch in slots so that, when the 0.6 mm feeler gauge is inserted at the throttle-valve stop, the switch just opens.
- * After adjusting, lock fastening screws with locking paint.

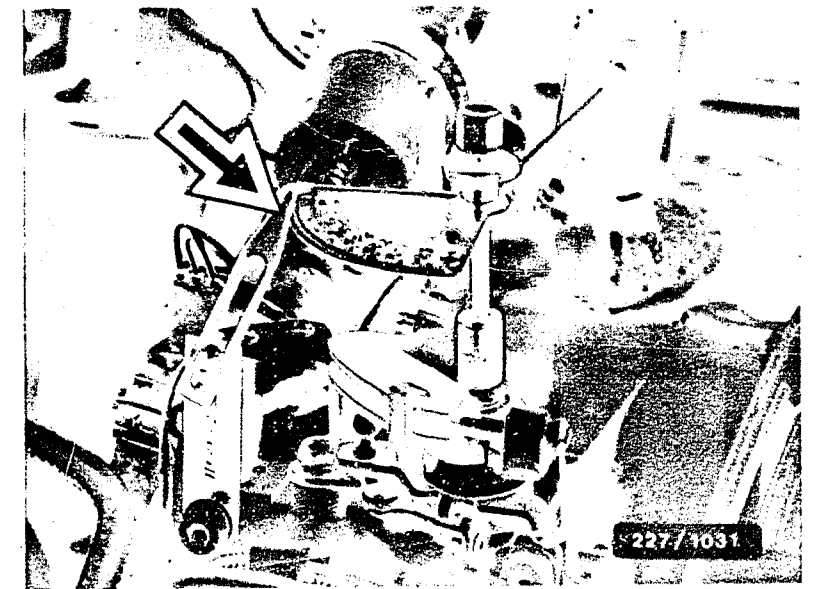


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↓
Replace and adjust full-load throttle-valve switch.

- * Screw graduated disk onto throttle-valve shaft (1st stage). If necessary, unscrew fastening nut for throttle lever.
- * Set graduated disc to 0°.
- * Slowly open throttle valve.
- * Set value: 68...76° after idle position of throttle valve, ohmmeter must indicate 0 Ω .
- * Loosen fastening screws of switch and move switch in slots until set value is obtained.
- * After adjusting, lock fastening screws with locking paint.



↓
Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (2) CONTINUED (2)

Check leads to idle throttle-
valve with ohmmeter:

N>

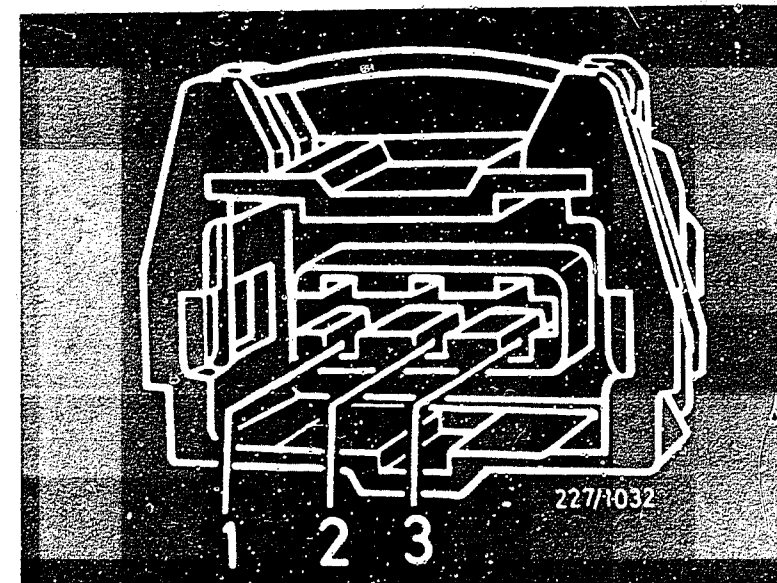
Eliminate defect in lead.

Disconnect plugs from KE
and EI-K control units and
from throttle-valve switch.
Check for short circuit in
leads at plug for throttle-
valve switch terminal 1 to
2.

Set value: infinity Ω

Set value obtained?

Return to self-diagnosis
test table B11



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (3)

SELF-DIAGNOSIS FLASHING CODE 2122

KE control unit receiving
no engine-speed signal from EI-K
control unit.

Perform visual examination
at plugs of KE control unit
and EI-K control unit:
plugs correctly connected,
contacts corroded?
Spring contacts must be
latched and must not allow
themselves to be pushed back.

Plug O.K.?

Eliminate defects on plug.
If necessary, replace
plug or spring contacts.

Check lead from KE control
unit terminal 30 to EI-K
control unit terminal 17
with ohmmeter:

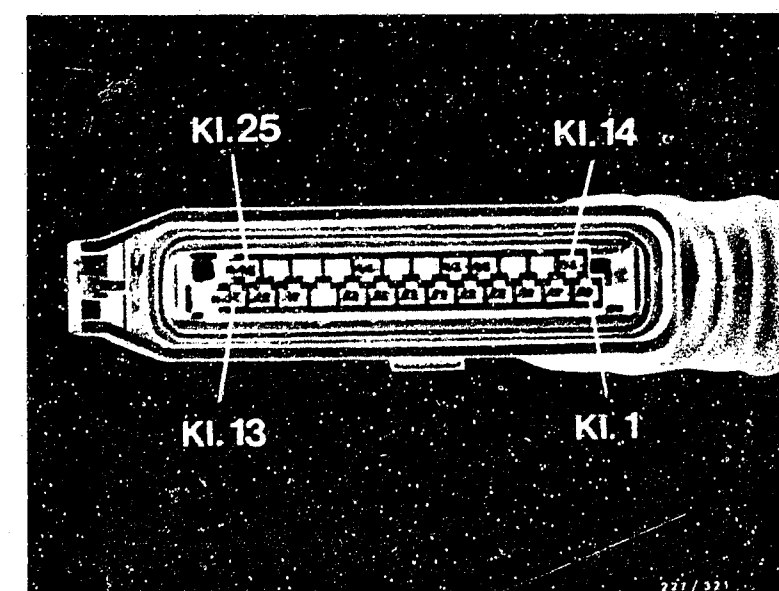
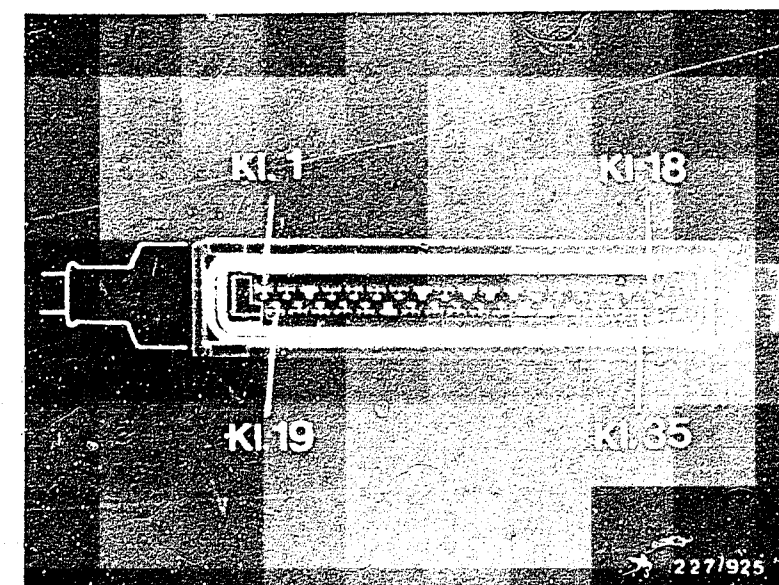
Measure resistance between
the two terminals directly
at the pins.

Set value: 0 Ω

Set value obtained?

Eliminate defect in lead.

Return to self-diagnosis
test table B11



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (4)

SELF-DIAGNOSIS FLASHING CODE 2123

Note whether fault-code output is for EI-K or KE!

Full-load throttle-valve switch not opening or short circuit in leads.

Check full-load throttle-valve switch with ohmmeter:

Measure resistances values directly at the pins of the switch.

Set values:
Throttle valve closed
infinity Ω
throttle valve fully open
0 Ω

Set values obtained?

N>

Replace and adjust full-load throttle-valve switch or re-adjust.

If a defect is found on one throttle-valve switch, it is always necessary to replace and re-adjust both switches.

* Screw graduated disk onto throttle-valve shaft (1st stage). If necessary, unscrew fastening nut for throttle lever.

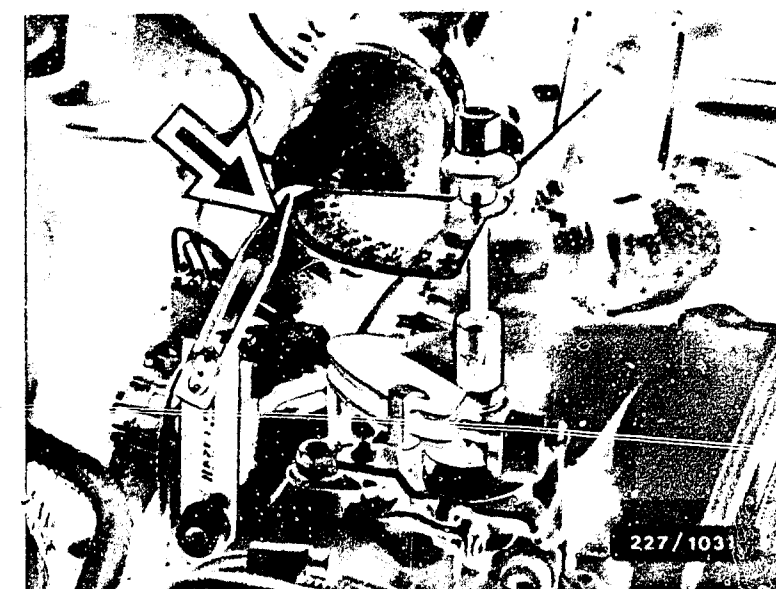
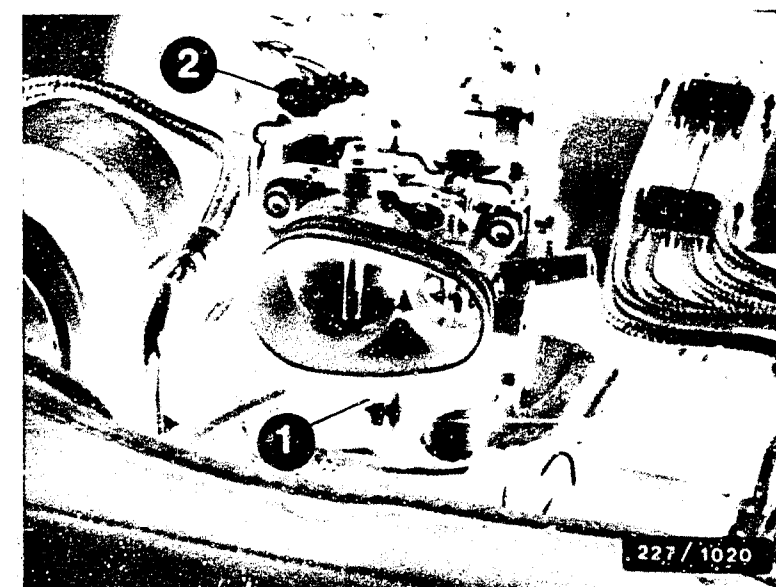
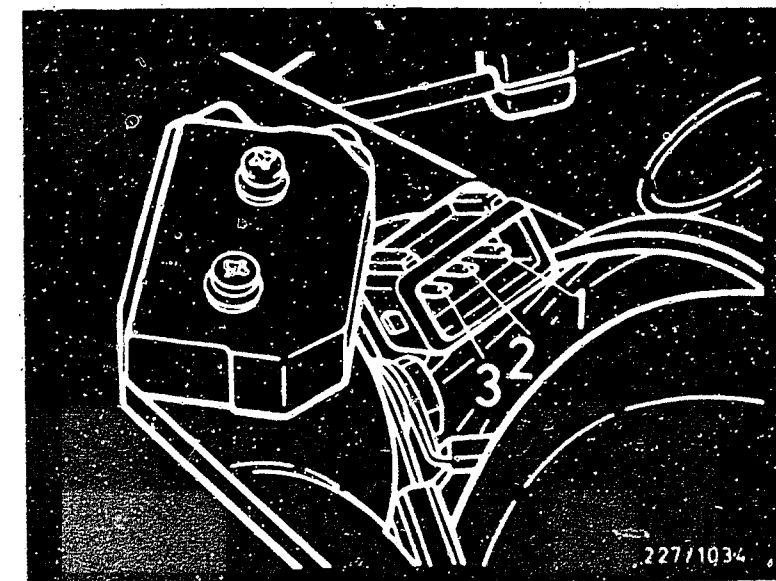
* Set graduated disk to 0°.

* Slowly open throttle valve.

* Set value: 68...76° after idle position of throttle valve, ohmmeter must indicate 0 Ω .

* Loosen fastening screws of switch and move switch in slots until set value is obtained.

* After adjusting, lock fastening screws with locking paint.

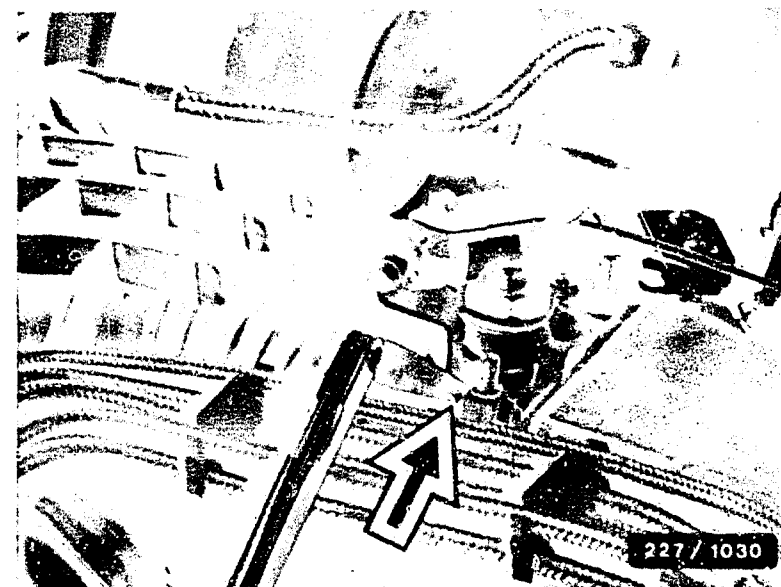


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↓
Replace and adjust idle
throttle-valve
switch.

- * Remove throttle-valve part.
- * Connect ohmmeter to idle
throttle-valve switch.
- * Loosen fastening screws of
switch and move switch
in slots so that, when the
0.6 mm feeler gauge is
inserted at the throttle-
valve stop, the switch
just opens.
- * After adjusting, lock
fastening screws with
locking paint.



↓
Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (4) CONTINUED (2)

Check leads to full-load
throttle-valve switch
with ohmmeter:

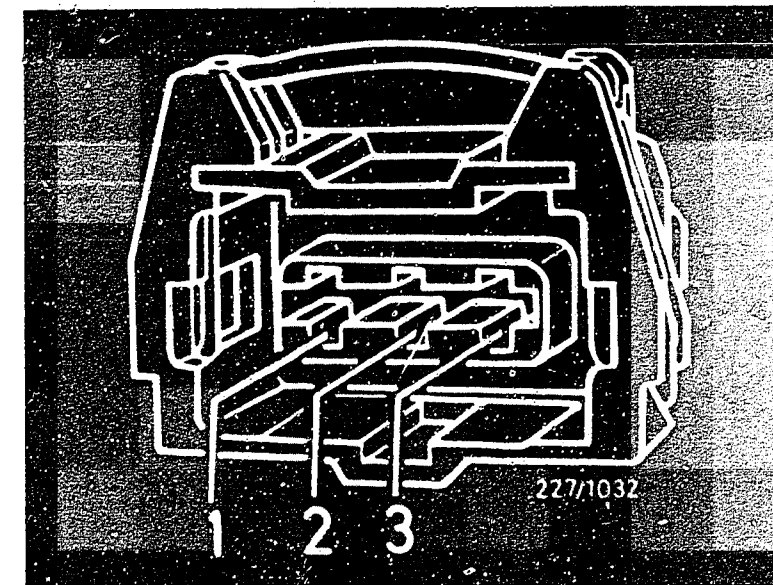
Disconnect plugs from KE
and EI-K control units and
from throttle-valve switch.
Check for short circuit in
leads at plug for throttle-
valve switch terminal 2 to
terminal 3.

Set value: infinity Ω

Set value obtained?

Eliminate defect in lead.

Return to self-diagnosis
test table B11



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (5)

SELF-DIAGNOSIS FLASHING CODE 2223

Note whether fault-code output is for EI-K or KE!

Altitude sensor/lead defective.

Check power supply to altitude sensor:

Connect plug to KE control unit. Switch on ignition. Measure voltage between terminal 2 and terminal 3 on plug of altitude sensor.

Set value: 4.35...5.35 V

Set value obtained?

N>

Check leads from KE control unit to altitude sensor with ohmmeter.

Measure resistance from control-unit plug terminals 25, 26 and 35 to plug of altitude sensor.

Set value: 0 Ω

If leads O.K., replace KE control unit.

Check voltage signal of altitude sensor with voltmeter:

Switch on ignition. Measure voltage at altitude sensor with plug connected with test prods between terminal 1 and terminal 3.

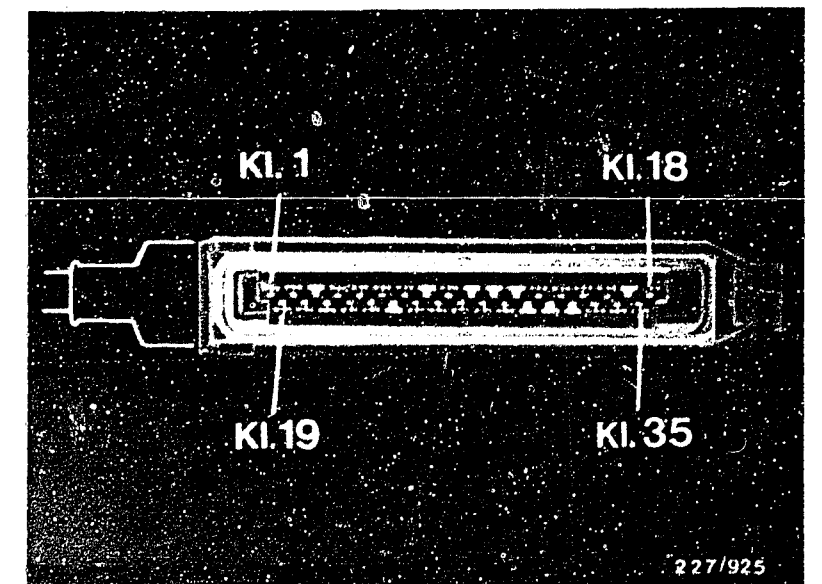
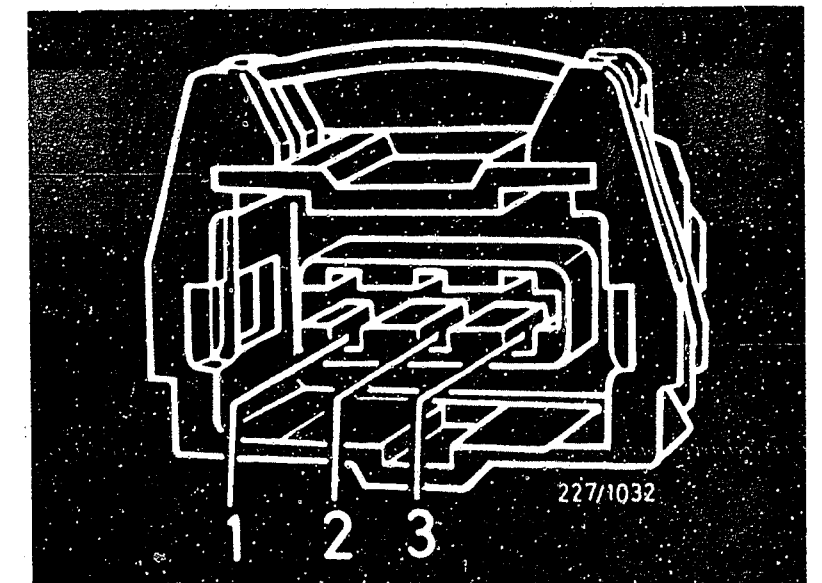
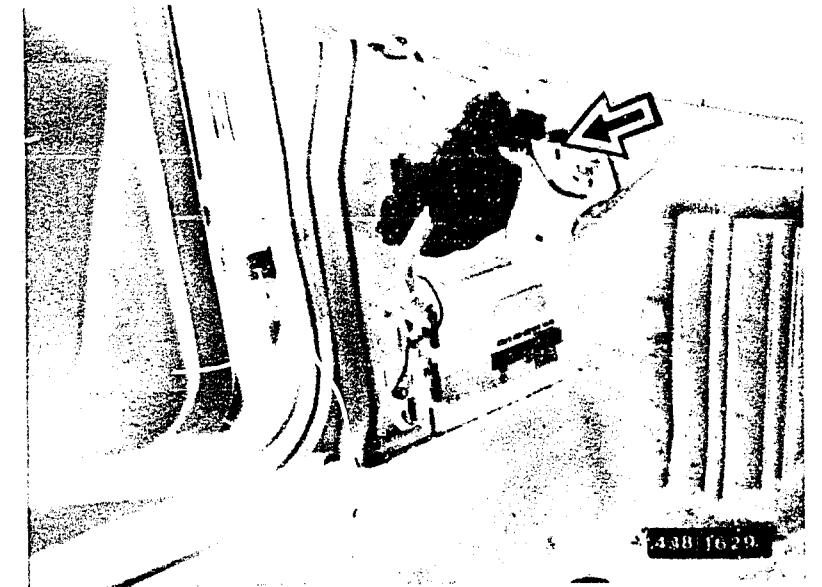
Set value: see vehicle-specific brief instructions.

Set value obtained?

N>

Replace altitude sensor

Continued on next picture page



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (5) CONTINUED (1)

Check lead from KE control unit to altitude sensor with ohmmeter:

Measure resistance from control-unit plug terminal 25 to plug of altitude sensor terminal 1.

Set value: 0 Ω

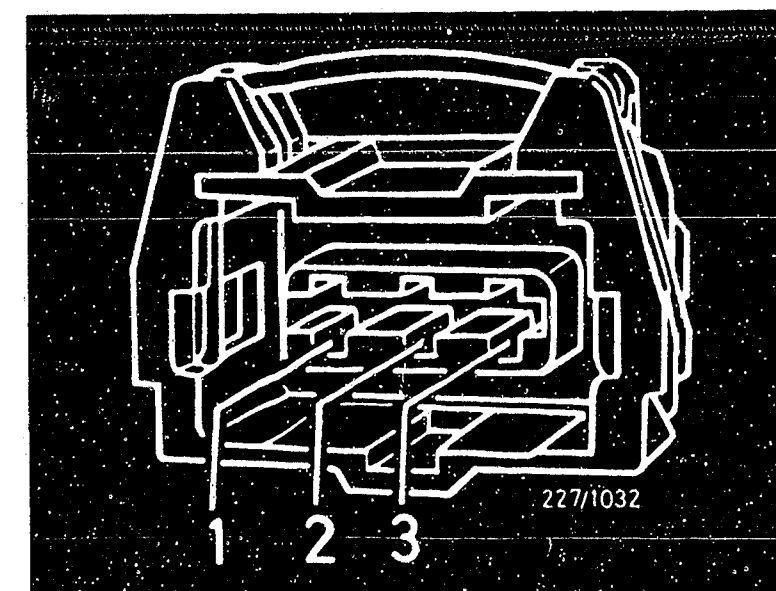
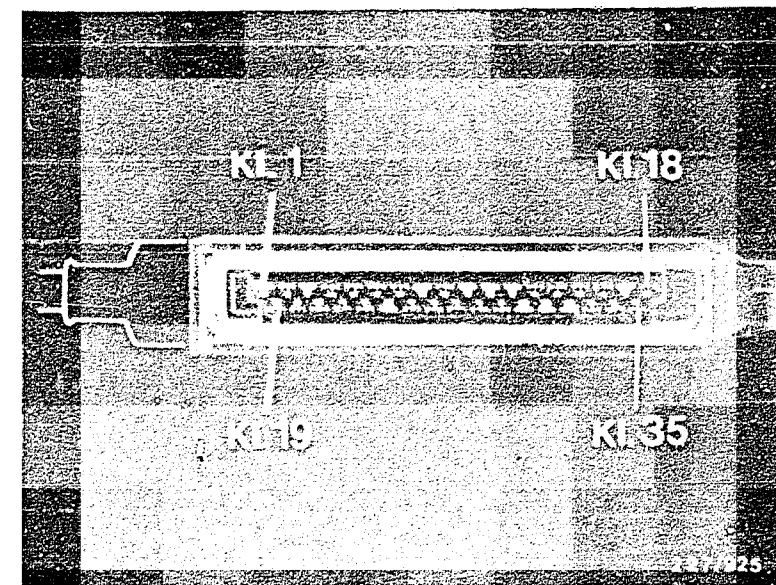
Set value obtained?

Eliminate defect in lead.

Return to self-diagnosis test table B13

C07

C08



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (6)

V

SELF-DIAGNOSIS FLASHING CODE 2232

Potentiometer on air-flow sensor/leads defective.

Check power supply to potentiometer:

Connect plug to KE control unit. Switch on ignition. Measure voltage between terminals 1 and 3 on plug of potentiometer.

Set value: 4.35...5.35 V

Set value obtained?

N>

Check leads from KE control unit to potentiometer with ohmmeter:

Measure resistance from control-unit plug terminals 23, 26 and 35 to plug of potentiometer.

Set value: 0 Ω

If lead O.K., replace KE control unit.

Y

V

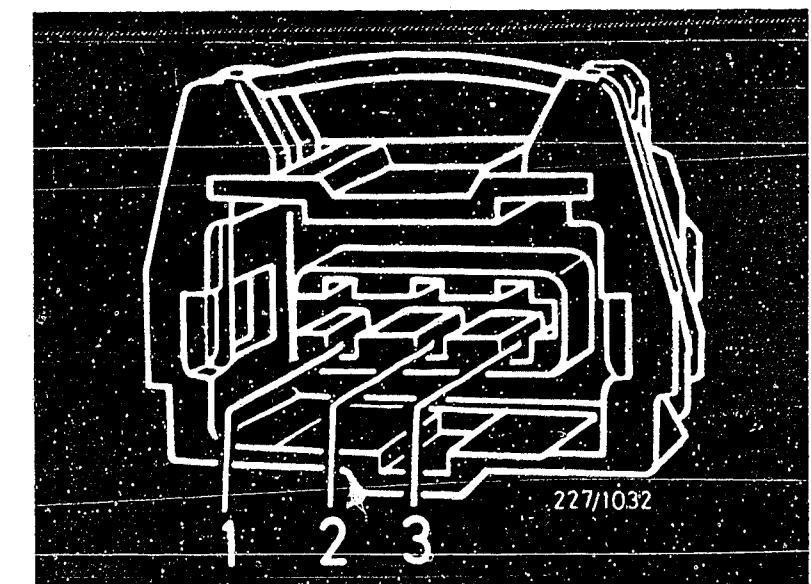
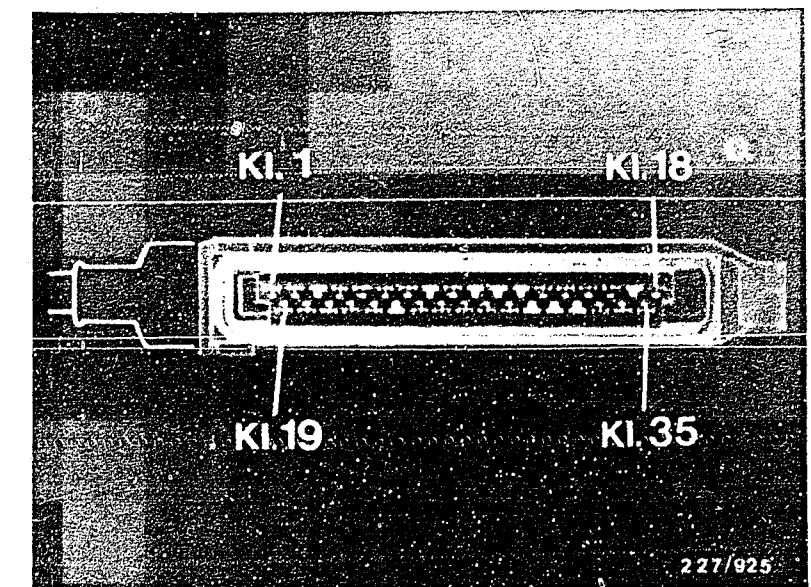
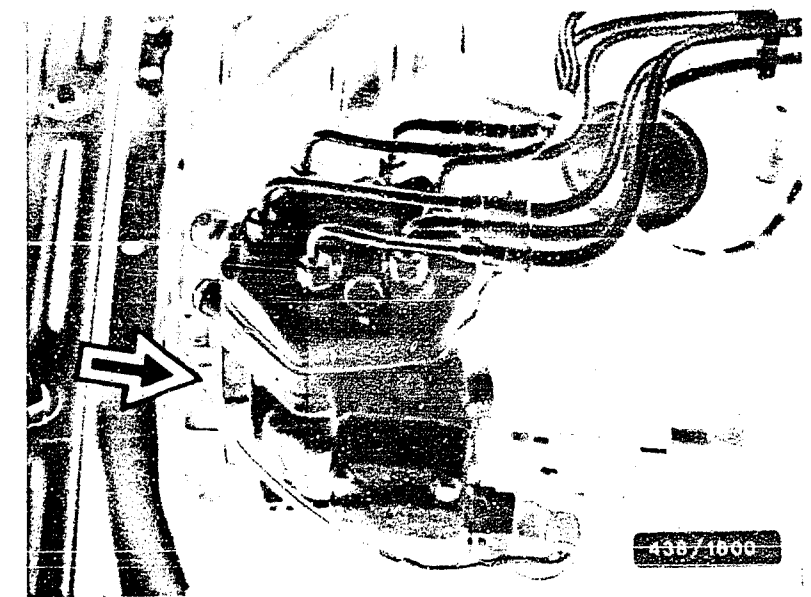
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C09

<=>

C10

<=>



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (6) CONTINUED (1)

Check voltage signal
of potentiometer with
voltmeter:

Install test leads KDZS 0004
and KDUM 0008 between plug of
potentiometer and
potentiometer.
Switch on ignition.
Deflect air-flow sensor plate.
Measure voltage at
potentiometer between
terminals 2 and 3.

Set value: see vehicle-
specific brief instructions.

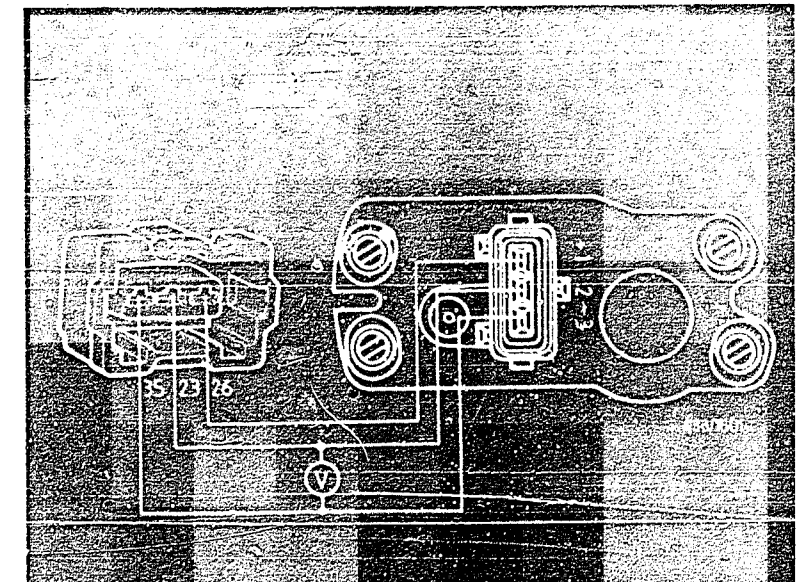
Set value obtained?

N>

Replace air-flow sensor.

Note the following when
removing and installing:

- * When loosening and subsequently
tightening the fuel lines,
hold the fixed hexagonal sec-
tion on the fuel distributor
with a wrench.
- * Do not use any sealing com-
pound between air-flow sensor
and air-filter housing.
- * Tightening torque: 9...10 Nm
- * Adjust free travel of sensor
plate at slotted-head screw
in fuel distributor.
- * Free travel: so that it can be
felt up to 2 mm at center of
sensor plate.
- * Replace seal ring between fuel
distributor and air-flow sensor.
- * Tightening torque for the
three fastening screws:
3.2...3.8 Nm



Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (6) CONTINUED (2)

V

Check lead from KE control
unit to potentiometer with
ohmmeter.

Measure resistance from control-
unit plug terminal 23 to plug
of potentiometer terminal 2.

Set value: 0 Ω

Set value obtained?

N>

Eliminate defect in lead.

Y

Return to self-diagnosis
test table B13

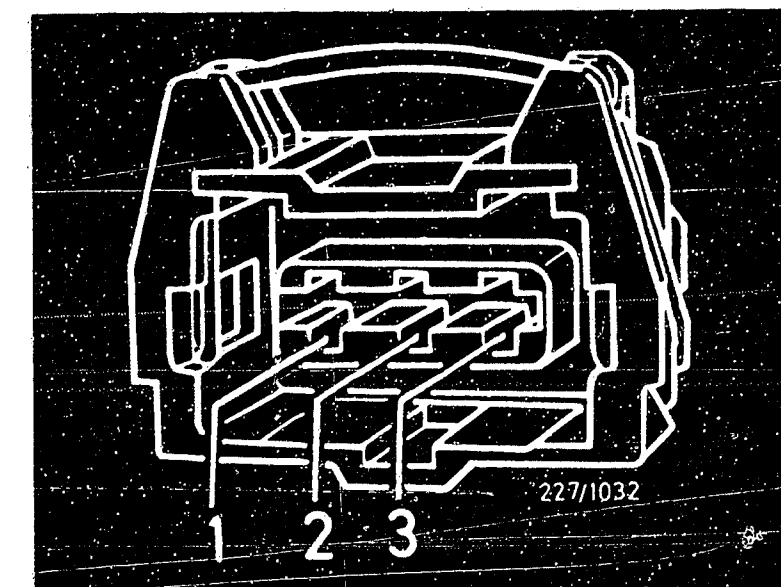
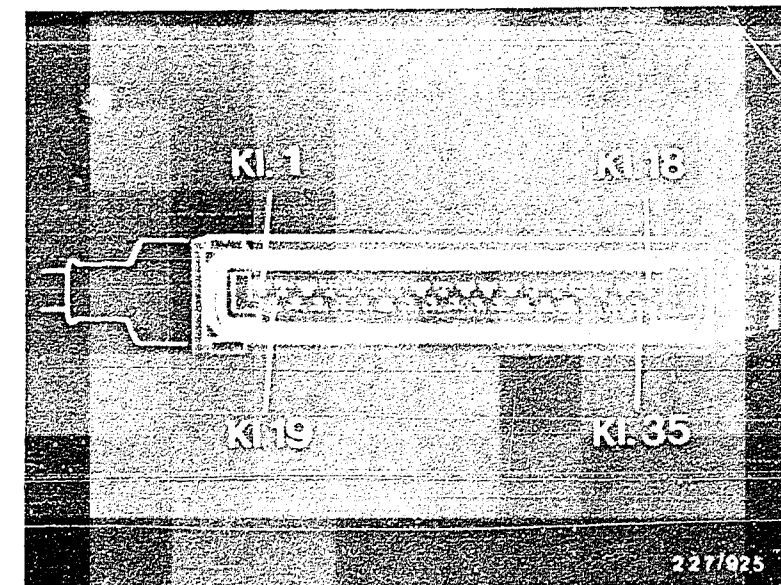
V

C13

<=>

C14

<=>



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (7)

SELF-DIAGNOSIS FLASHING CODE 2233

Reference voltage for load
signal and altitude signal for
EI-K control unit.

Check whether fuse for engine
control is O.K.

Replace fuse.

Check power supply to
KE control unit:

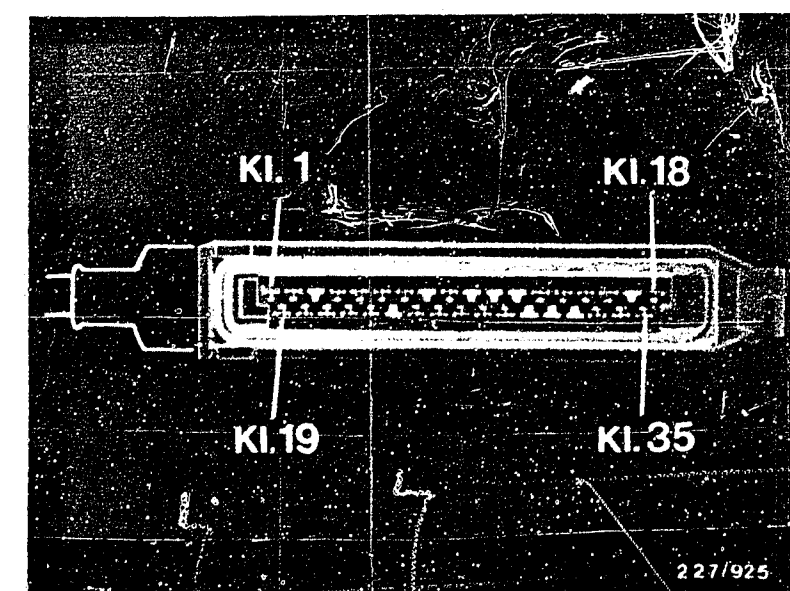
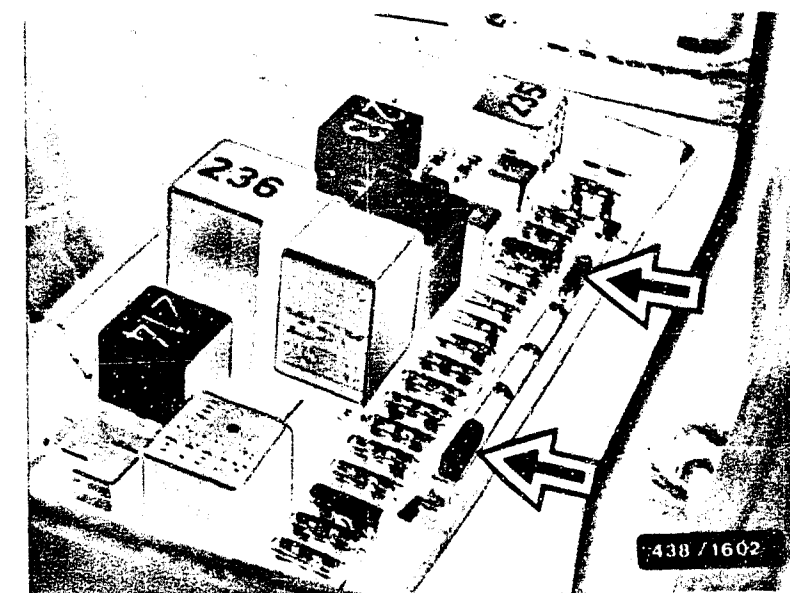
Disconnect KE control-unit
plug. Switch on ignition and
measure with voltmeter
between terminals 14 and 18.

Set value: Battery voltage

Set value obtained?

Eliminate open circuit in
power supply.

Continued on next picture page



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (7) CONTINUED (1)

Perform visual examination
at plugs of KE control unit
and EI- control unit:

Plugs correctly connected,
contacts corroded?
Spring contacts must be
latched and must not allow
themselves to be pushed back.

Plug O.K.?

N>

Eliminate defects on plug.
If necessary, replace
plug or spring contacts.

Y

Check lead from KE control
unit terminal 26 to EI-K control
unit terminal 21 with ohmmeter:

Measure resistance between
the two terminals directly
at the plugs.

Set value: 0 Ω

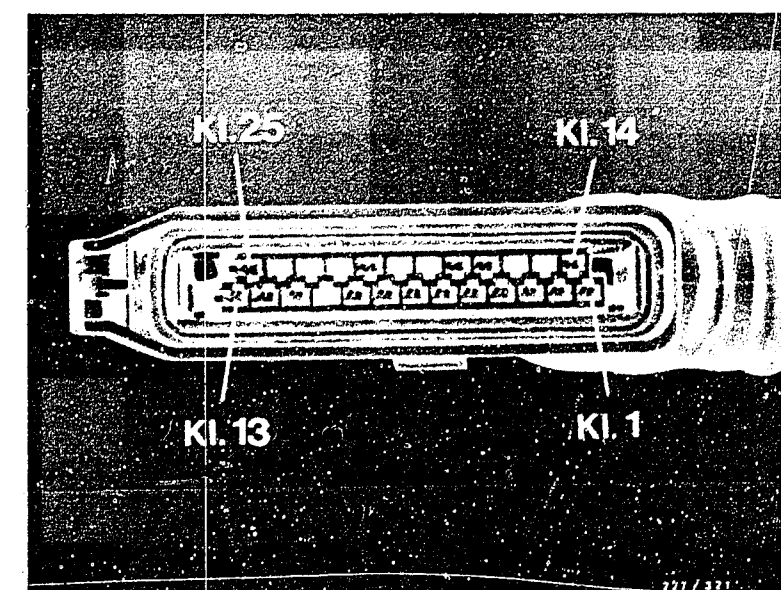
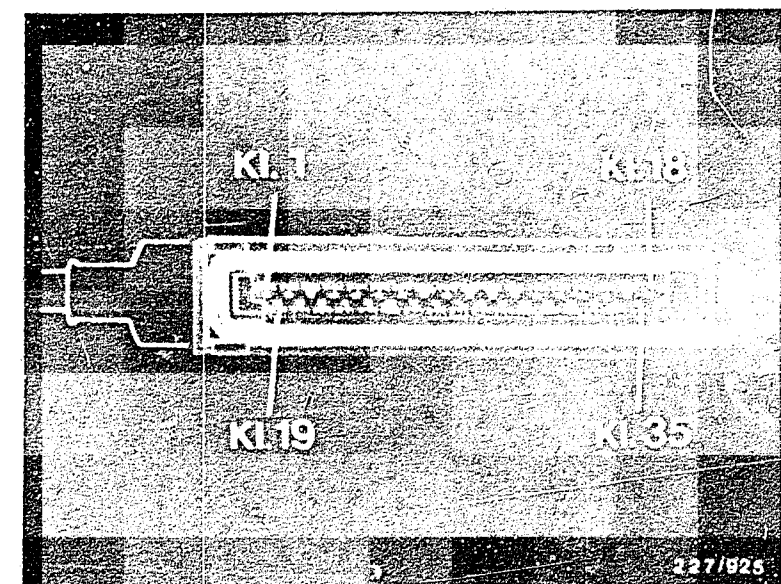
Set value obtained?

N>

Eliminate defect in lead.

Y

Return to self-diagnosis
test table B13



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (8)

SELF-DIAGNOSIS FLASHING CODE 2312

Note whether fault-code output is for EI-K or KE!

Temperature sensor (coolant)/ lead defective.
(Double NTC, one connection for KE-Jetronic)

Check temperature sensor ohmmeter:

Measure resistance between temperature sensor and vehicle ground.

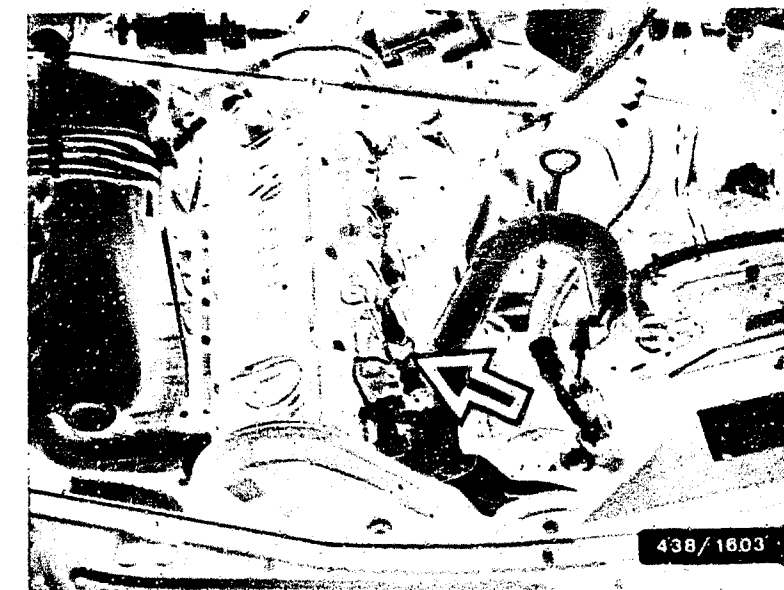
Set values:

Engine temperature 15...30° C
1300...3600 Ω

Engine temperature approx. 80° C
250... 390 Ω

Set values obtained?

Replace temperature sensor (coolant).



Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (8) CONTINUED (1)

Check lead to temperature sensor (coolant) with ohmmeter:

Measure resistance between terminal 3 on control-unit plug and temperature-sensor plug.

Set value: 0 Ω

Set value obtained?

Eliminate defect in lead.

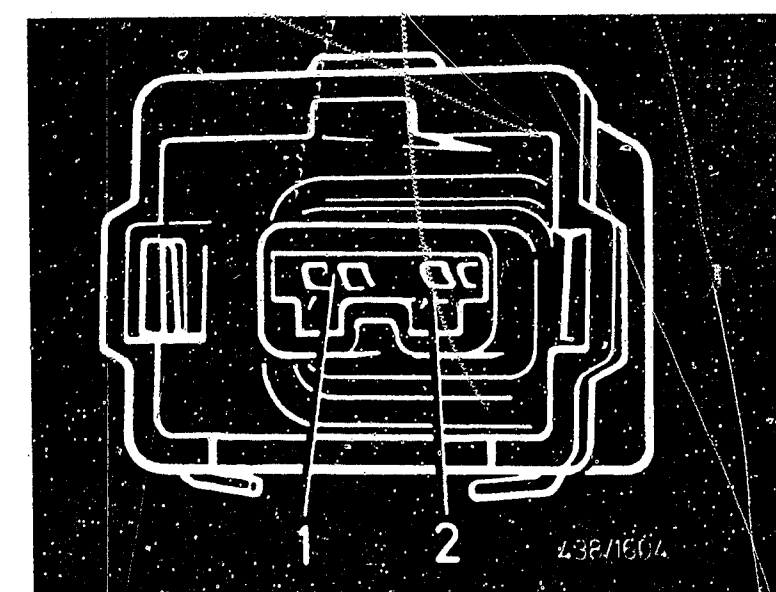
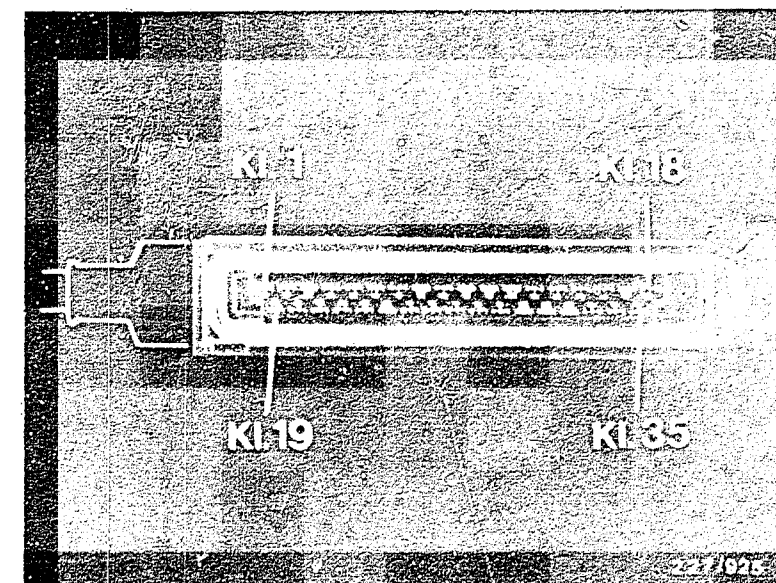
Measure resistance between temperature-sensor plug and vehicle ground.

Set value: infinity Ω

Set value obtained?

Eliminate defect in lead.

Return to self-diagnosis test table B13



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (9)

SELF-DIAGNOSIS FLASHING CODE 2342

Lambda sensor/lead defective
or control unit defective.

Check open-loop operation
of KE control unit:

Install test leads KDZS 0004
and KDUM 0008 between plug of
pressure actuator and pressure
actuator. Connect ammeter.
Disconnect lambda-sensor
plug. Start engine and
operate at idle. Measure
current at pressure actuator
in op-loop load.

Set value:
Constant between -1...+1 mA

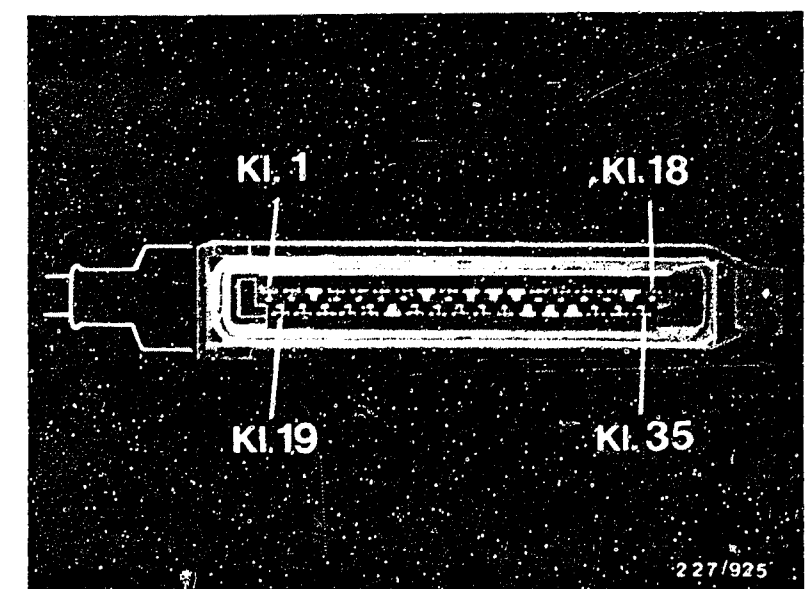
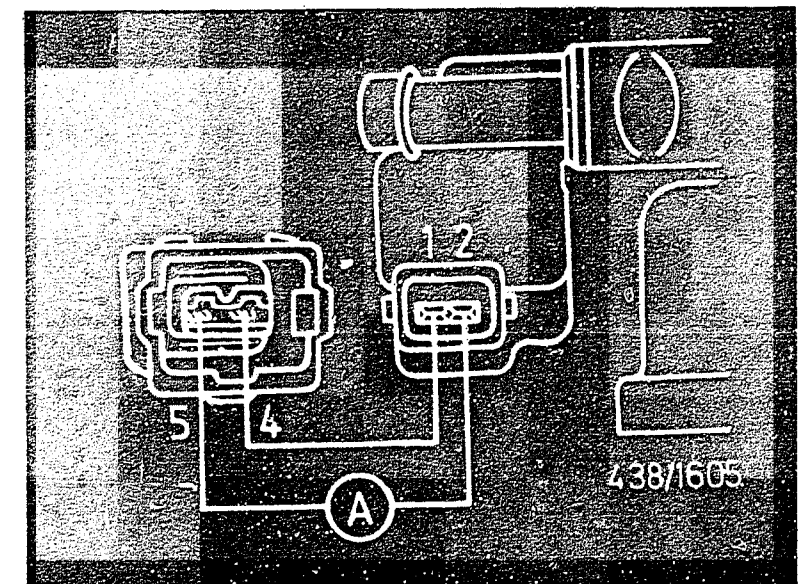
Set value obtained?

N>

Using ohmmeter, check lead
from KE control unit terminal
7 to lambda sensor for short
circuit to ground and
positive:

Set value: infinity Ω

If lead O.K., replace KE
control unit.



Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (9) CONTINUED (1)

Check closed-loop function
KE control unit:

Hold cable of Lambda sensor
leading to KE control unit
against vehicle ground.
Current value must rise.

Set value: See vehicle-
specific brief instructions.

Place cable against the positive
pole of a 1.5 V monocr cell and
hold the negative pole of the
monocr cell against vehicle ground.
Current value decreases.

Set value: see vehicle-specific
brief instructions.

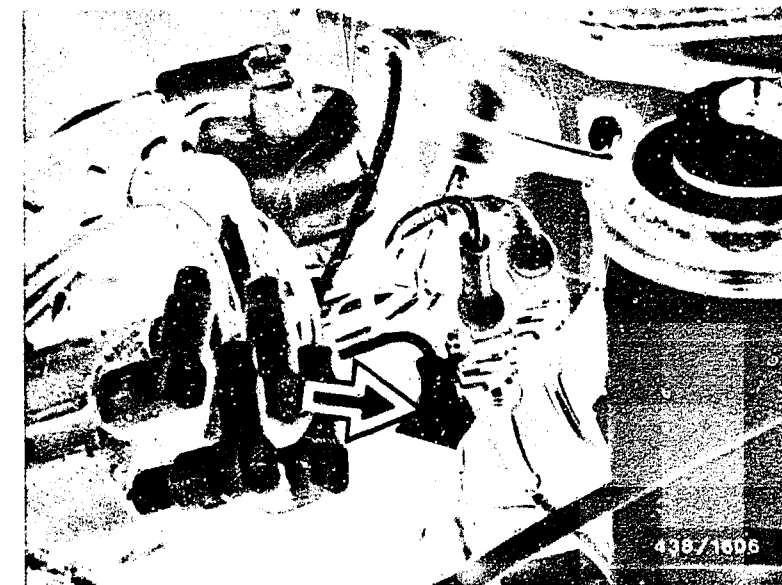
Set values obtained?

N>

Using ohmmeter, check lead
from KE control unit terminal
7 to lambda sensor for open
circuit:

Set value: 0 Ω

If lead O.K., replace KE
control unit.



Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (9) CONTINUED (2)

Check lambda sensor:

Connect lambda sensor.
Start engine and bring to
an engine temperature of min.
50°C and operate at idle. Read
off measured value.

Set value:
Reading fluctuates about 0 mA

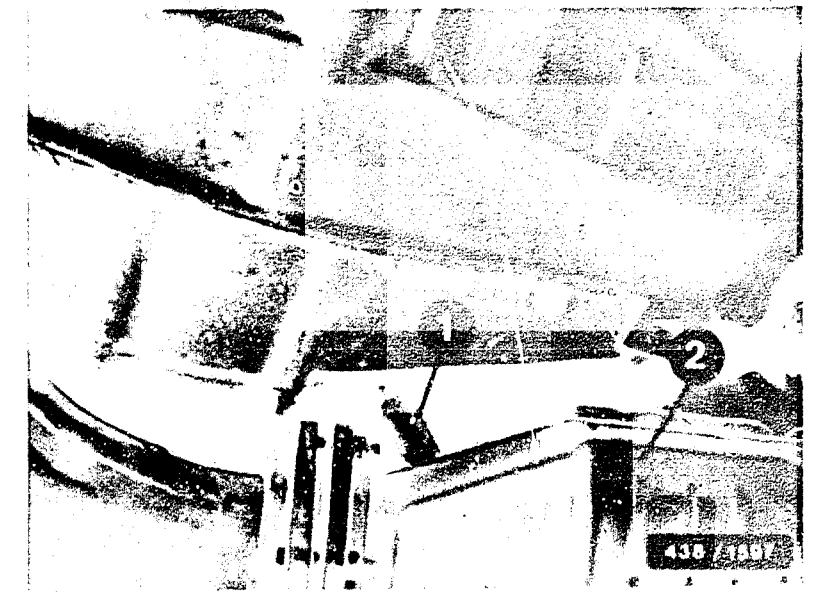
Set value obtained?

N>

*Reading fluctuating, but mean
value not within tolerance:
adjust CO concentration.

* Reading static (not
fluctuating):
Replace lambda sensor.

Before installing, lubricate
the thread of the lambda
sensor with mounting paste
VS 14016 Ft. Part
number: 5 964 080 112



1 = Lambda sensor
2 = Catalytic converter

Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (9) CONTINUED (3)

Check heating of lambda sensor:

Jump safety circuit. Using voltmeter, measure voltage at double plug of lambda-sensor heating.

Set value: battery voltage

Set value obtained?

N>

Eliminate open circuit in power supply.

Y

Using ohmmeter on sensor-side half of plug, check internal resistance of lambda-sensor heating.

Set value: 1...15 Ω

Set value obtained?

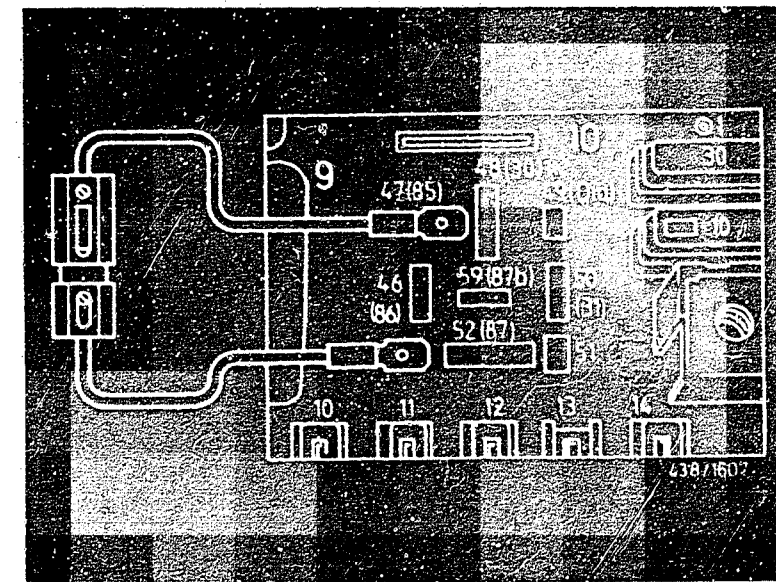
N>

Replace lambda sensor.

Before installing, lubricate the thread of the lambda sensor with mounting paste VS 14016 Ft. Part number: 5 964 080 112

Y

Return to self-diagnosis test table 813



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (10)

V

SELF-DIAGNOSIS FLASHING CODE 4341

Pressure actuator/lead defective.

Check internal resistance of pressure actuator with ohmmeter:

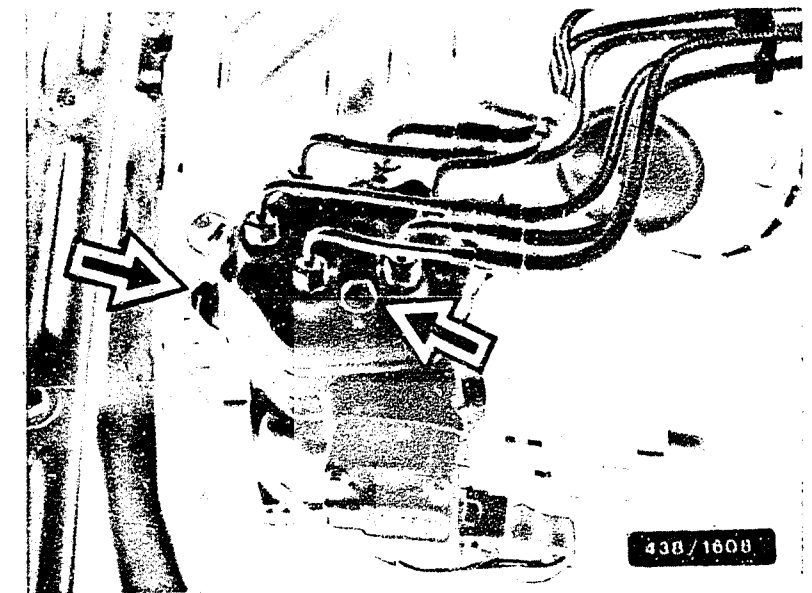
Set value: 16...22 Ω

Set value obtained?

N>

Replace pressure actuator.

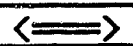
To do this, clean fuel distributor in area of pressure actuator.
Unscrew pressure actuator.
Always mount new pressure actuator with new seal rings and genuine fastening screws (non-magnetic steel).



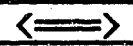
Y

Continued on next picture page

D03



D04



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (10) CONTINUED (1)

V

Using ohmmeter, check leads from KE control unit terminals 4 and 5 to pressure actuator for the following faults:

Open circuit

Set value: 0 Ω

Short circuit in lead

Set value: infinity Ω

Short circuit of lead to ground and positive

Set value: infinity Ω

Set values obtained?

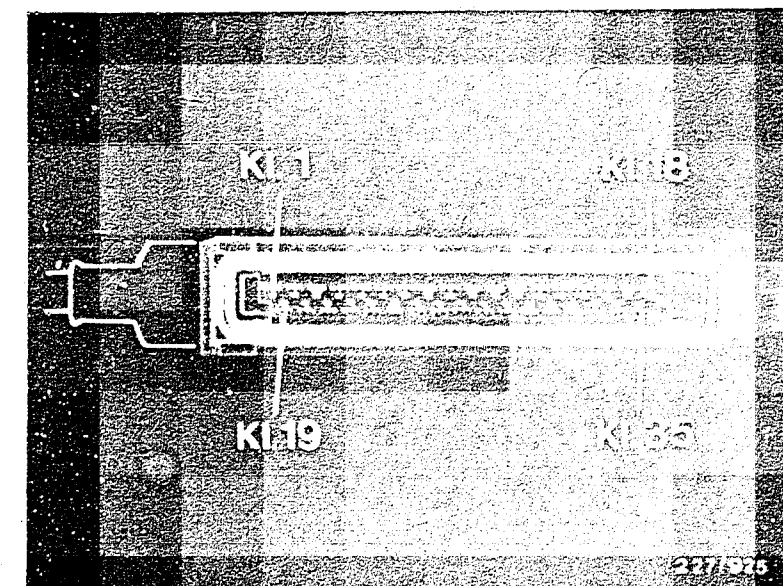
N>

Eliminate defect in lead.

Y

Return to self-diagnosis test table B15

V



D05

<=>

D06

<=>

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (11)

SELF-DIAGNOSIS FLASHING CODE 4343

Tank-ventilation valve/lead defective.

Check power supply to tank ventilation valve

Switch on ignition.
Measure voltage at plug of tank-ventilation valve at term. 1 to vehicle ground.

Set value: battery voltage

Set value obtained?

Eliminate open circuit in power supply.

Tank-ventilation valve/lead defective.

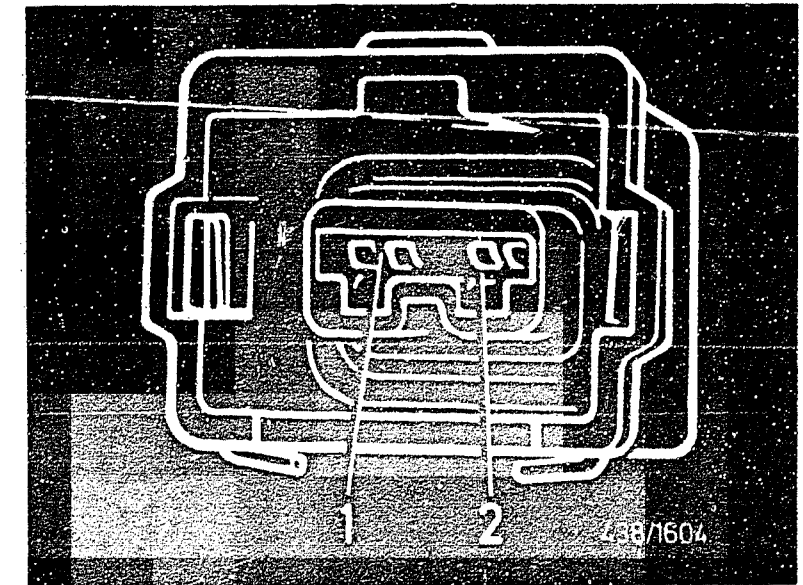
Check internal resistance of tank-ventilation valve with ohmmeter:

Set value: see vehicle-specific brief instructions.

Set value obtained?

Replace tank-ventilation valve.

Continued on next picture page



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (11) CONTINUED (1)

V

Using ohmmeter, check lead
from KE control unit terminal
15 to tank-ventilation valve
for the following faults:

Open circuit

Set value: 0 Ω

Short circuit in lead

Set value: infinity Ω

Short circuit of lead
to ground and positive

Set value: infinity Ω

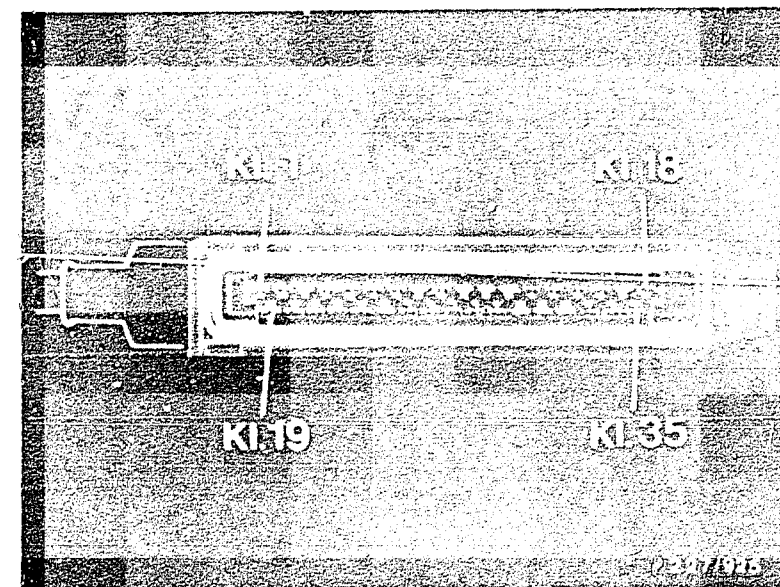
Set values obtained?

N>

Eliminate defect in lead.

Y

Return to self-diagnosis
test table B15



D09

<=>

D10

<=>

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (12)

SELF-DIAGNOSIS FLASHING CODE 4431

Idle actuator/lead defective.

Check power supply to idle actuator:

Switch on ignition.
Measure voltage at plug of idle actuator, at term. 1 to vehicle ground.

Set value: battery voltage

Set value obtained?

N>

Eliminate open circuit in power supply.

Y

V

Measure internal resistance of idle actuator with ohmmeter:

Set value: see vehicle-specific brief instructions.

Set value obtained?

N>

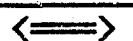
Replace idle actuator.

Y

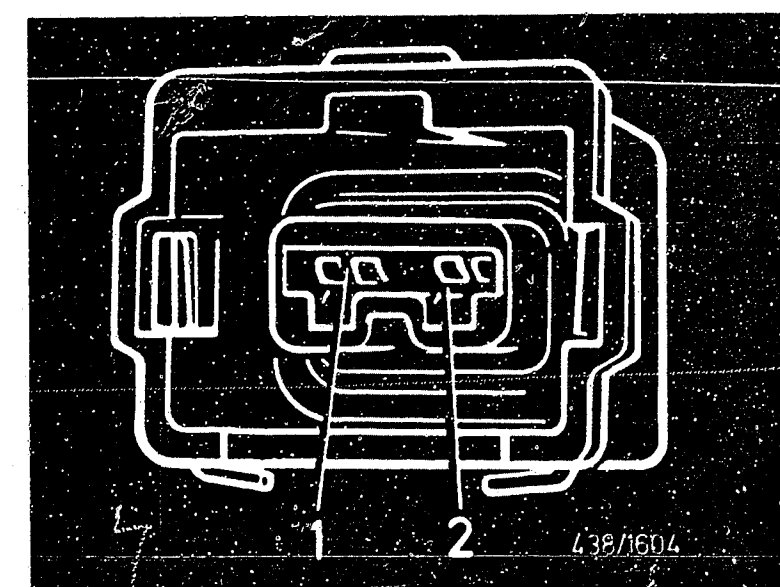
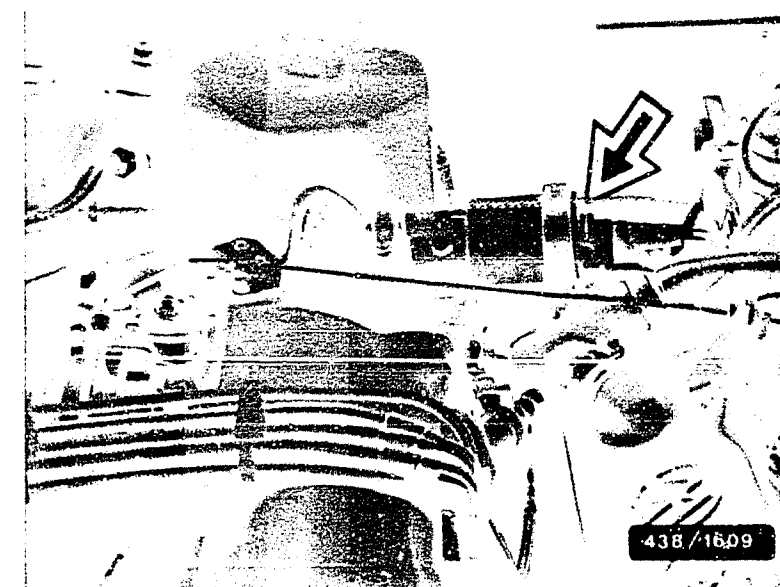
V

Continued on next picture page

D11



D12



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (12) CONTINUED (1)

V

Using ohmmeter, check lead
from KE control unit terminal
17 to idle actuator for
the following faults:

N>

Eliminate defect in lead.

Open circuit

Set value: 0 Ω

Short circuit in lead

Set value: infinity Ω

Short circuit of lead
to ground and positive

Set value: infinity Ω

Set values obtained?

Y

Return to self-diagnosis
test table B15

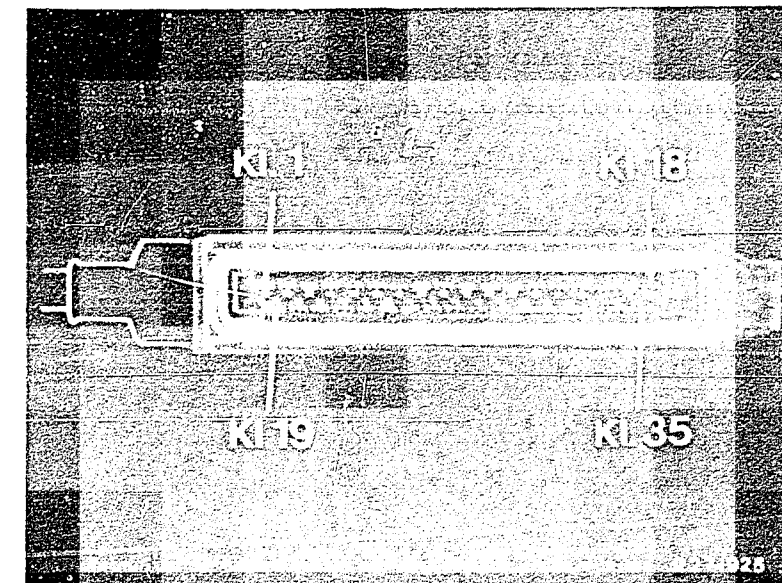
V

D13

<=>

D14

<=>



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (13)

SELF-DIAGNOSIS FLASHING CODE 4443

Start valve/lead defective.

Check power supply to start valve:

Switch on ignition.
Measure voltage at plug at start valve at term. 1 to vehicle ground.

Set value: battery voltage

Set value obtained?

N>

Eliminate open circuit in power supply.

Measure internal resistance of start valve with ohmmeter:

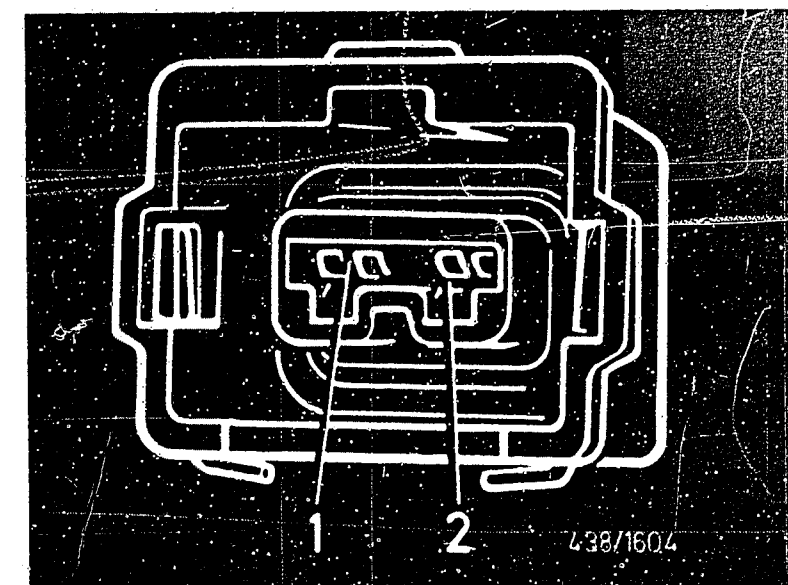
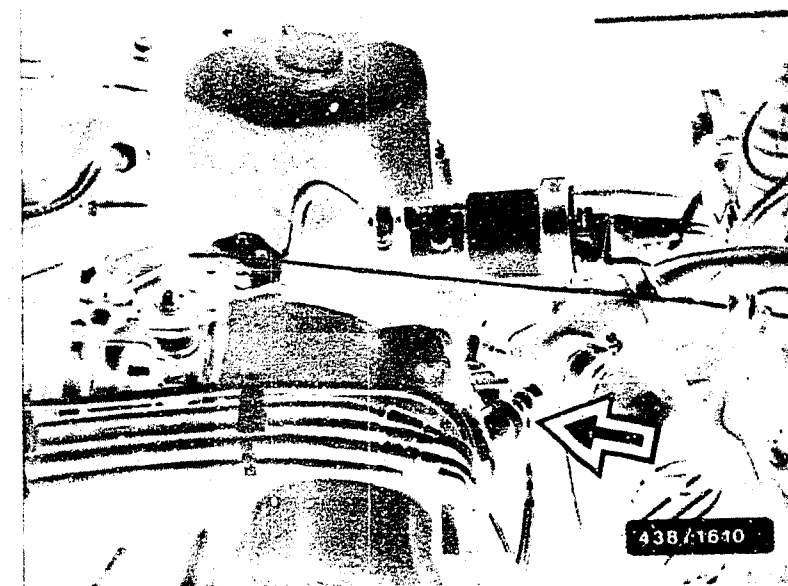
Set value: see vehicle-specific brief instructions.

Set value obtained?

N>

Replace start valve.

Continued on next picture page



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (13) CONTINUED (1)

V

Using ohmmeter, check lead
from KE control unit terminal
16 to start valve for the
following faults:

N>

Eliminate defect in lead.

Open circuit

Set value: 0 Ω

Short circuit in lead

Set value: infinity Ω

Short circuit of lead
to ground and positive

Set value: infinity Ω

Set values obtained?

Y

Return to self-diagnosis
test table B15

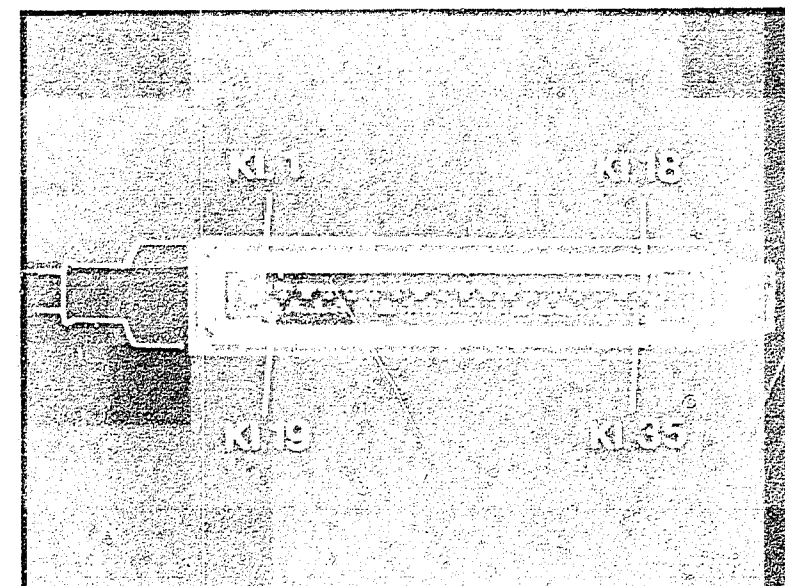
V

D17

<=>

D18

<=>



DIAGNOSIS OF FINAL CONTROL ELEMENTS (1)

V

The diagnosis of final control elements covers the energization and operation of the following components:

1. Pressure actuator
2. Tank-ventilation valve
3. Idle actuator
4. Start valve.

The sequence is specified in the program, i.e. the test sequence starts always with the pressure actuator.

Whenever a diagnosis is re-started, the control unit switches to the next component.

As a check, during the diagnosis of final control elements, the corresponding flashing code of the self-diagnosis is output for each component at the diagnosis lamp.

Test conditions: full-load throttle-valve switch and corresponding leads (to control unit) O.K.

Y

V

Continued on next picture page

DIAGNOIS OF FINAL CONTROL ELEMENTS (1) (CONTINUED 1)

1. Pressure actuator:

Connect ammeter to pressure actuator:

Disconnect plug from pressure actuator. Using auxiliary lead, re-connect lead from term. 1 to pressure actuator. Connect ammeter at term. 2 between pressure actuator and plug (test leads KDZS 0004 and KDUM 0008).

Set ammeter measuring range to 200 mA.

With ignition off, jump contacts on relay for electric fuel pump with fuse.

Switch on ignition and remove fuse after approx. 4 seconds.

Pressure actuator is energized; the current reading must change through actuation of the full-load throttle-valve switch.

Set value: see vehicle-specific brief instructions.

Do not then switch off ignition.

N>

Perform the following tests in the order given until the fault is found:

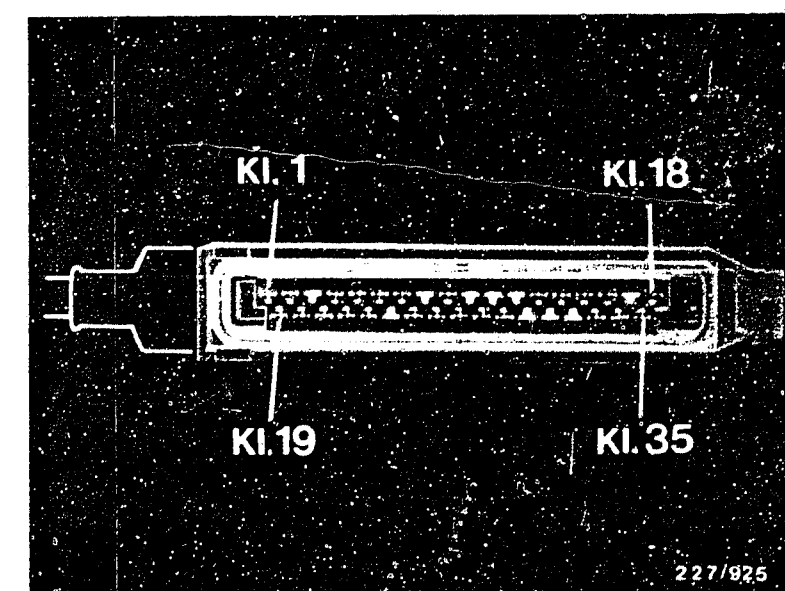
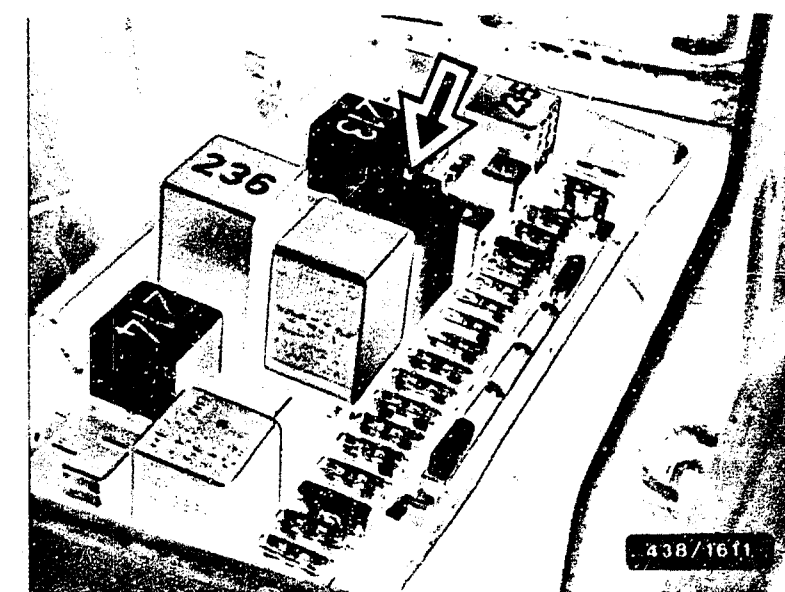
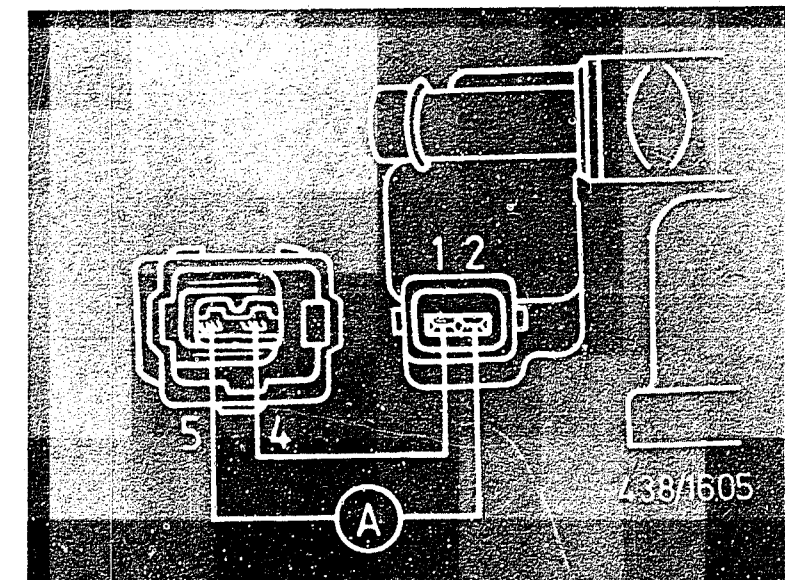
- * Resistance measurement directly at the two terminals of the pressure actuator.

Set value: see vehicle-specific brief instructions.

If measured value not within tolerance: replace pressure actuator.

To do this, clean fuel distributor in area of pressure actuator. Unscrew pressure actuator. Always mount new pressure actuator with new seal ring and genuine fastening screws (non-magnetic steel).

- * Switch off ignition. Disconnect plug from control unit. Using ohmmeter, check the leads from term. 4 and 5 to plug of pressure actuator term. 1 and 2 for:



Continued on next picture page

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DIAGNOIS OF FINAL CONTROL ELEMENTS (1) (CONTINUED 2)

Open circuit.
Set value: approx. 0 Ω .

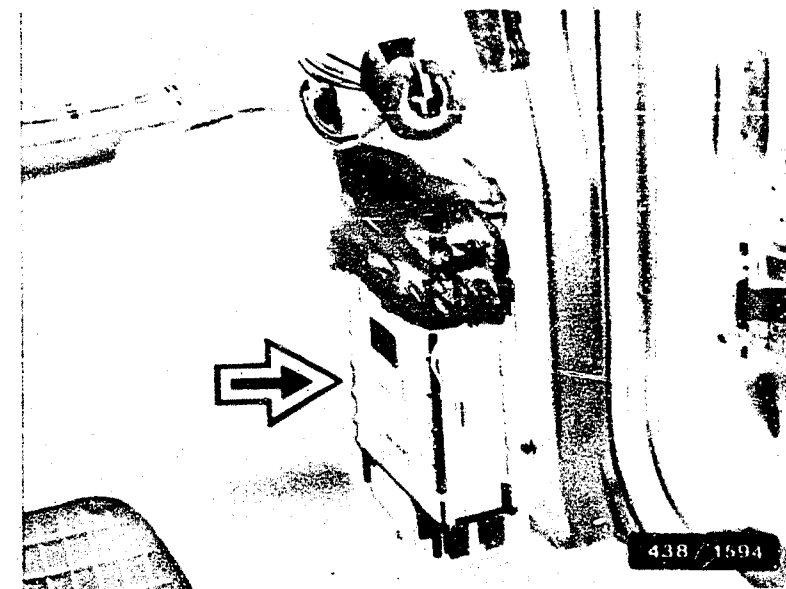
Short circuit to ground.
Set value: infinity Ω .

Short circuit of both leads
Set value: infinity Ω .

Eliminate any line faults.

* If both above tests O.K.:

Control unit defective.
Replace control unit.



Continued on next picture page

DIAGNOIS OF FINAL CONTROL ELEMENTS (1) (CONTINUED 3)

2. Tank-ventilation valve:

Flashing diagnosis: 4343.

Jump contacts on relay for electric fuel pump with fuse for at least 4 seconds. Actuate full-load throttle-valve switch and hold. The tank-ventilation valve is energized (rhythmical clicking noise).

The tank-ventilation valve is on the active-carbon filter next to the mixture-control unit in the right-hand wheel house.

Do not switch off ignition.

N>

Perform the following tests in the order given until the fault is found:

- * Do not switch off ignition. Disconnect plug from tank-ventilation valve and check voltage between both terminals. Indication in rhythmical sequence: battery voltage.

If energization O.K.: tank-ventilation valve mechanically defective. Replace valve.

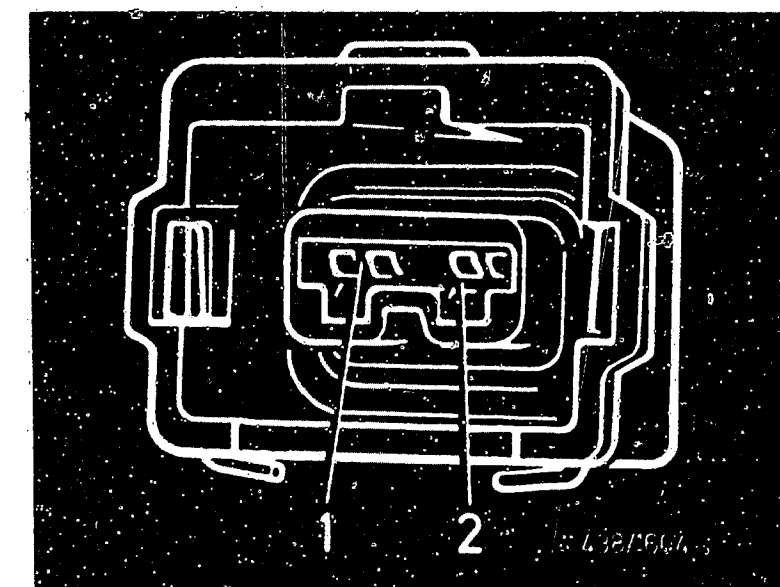
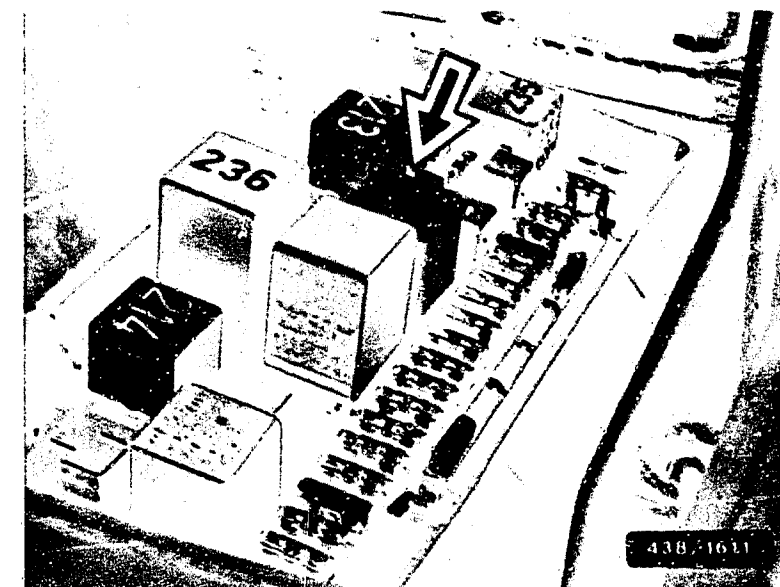
- * Resistance measurement directly at both terminals of tank-ventilation valve.

Set value: see vehicle-specific instructions.

If measured value not within tolerance: replace tank-ventilation valve.

- * Check power supply at plug of tank-ventilation valve at term. 1 to ground with ignition on.

Set value: battery voltage.



Continued on next picture page

Continued on next picture page

V

* Switch off ignition. Disconnect plug from control unit. Using ohmmeter, check lead from term. 15 to plug of tank-ventilation valve for:

Open circuit.
Set value: approx. 0 Ω .

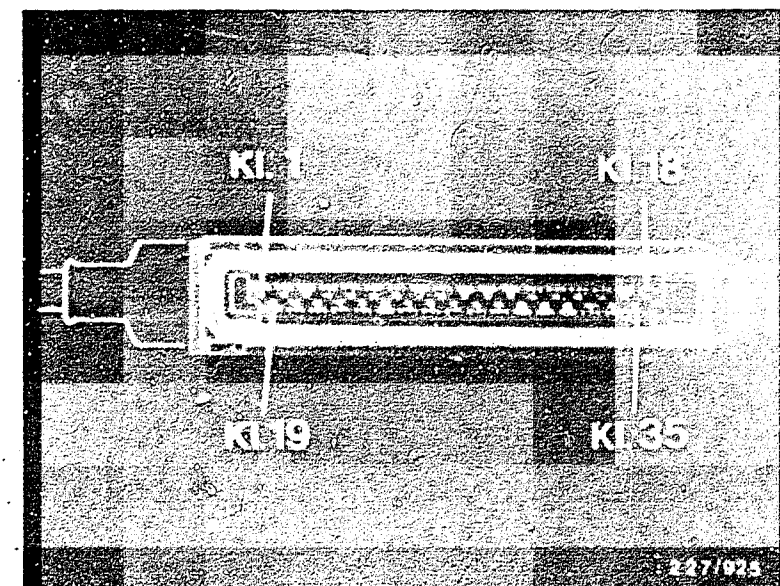
Short circuit to ground.
Set value: infinity Ω .

Eliminate any line faults.

* If above tests O.K.:

Control unit defective.

Replace control unit.



Continued on next picture page

DIAGNOIS OF FINAL CONTROL ELEMENTS (1) (CONTINUED 5)

3. Idle actuator:

Flashing code diagnosis: 4431.

Jump contacts at relay for electric fuel pump with fuse for at least 4 seconds. Actuate full-load throttle valve switch and hold. The idle actuator is energized (rhythmic clicking noise).

Do not switch off ignition.

N>

Perform the following tests in the order given until the fault is found:

- * Do not switch off ignition. Disconnect plug from idle actuator, and check voltage between both terminals. Indication in rhythmic sequence: battery voltage.

If energization O.K.: idle actuator mechanically defective. Replace actuator.

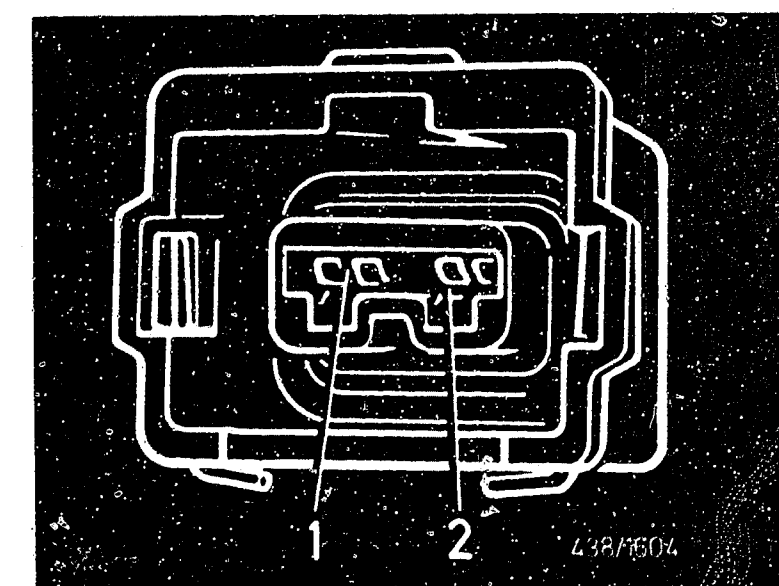
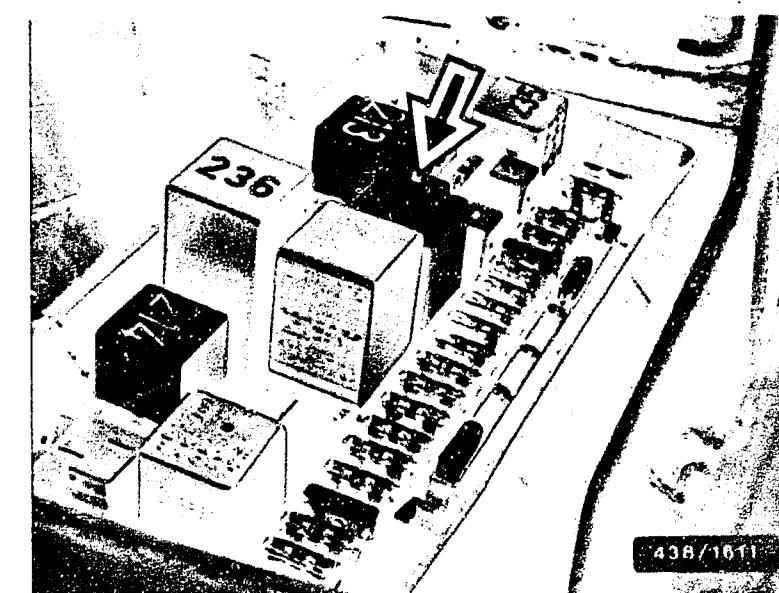
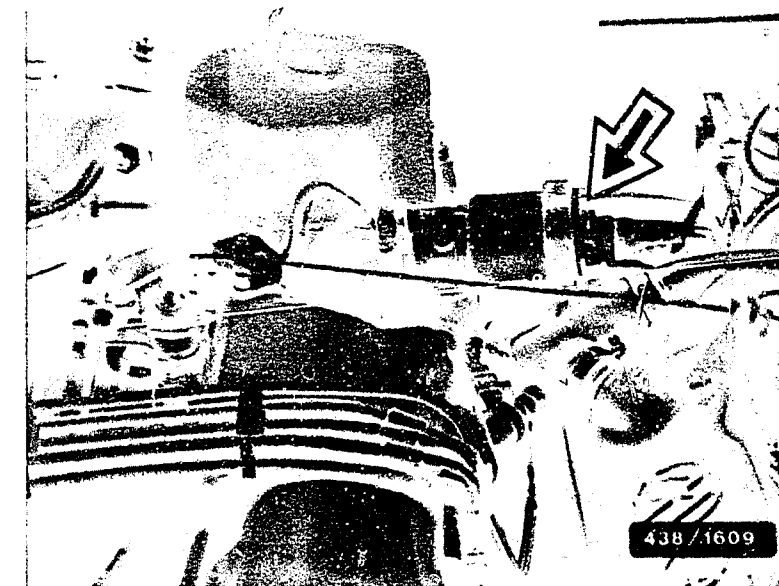
- * Resistance measurement directly at both terminals of idle actuator.

Set value: see vehicle-specific brief instructions.

If measured value not within tolerance: replace idle actuator.

- * Check power supply at plug of idle actuator, to ground with ignition on.

Set value: battery voltage.



Continued on next picture page

Continued on next picture page

V

* Switch off ignition. Disconnect plug from control unit. Using ohmmeter, check lead from term. 17 to plug of idle actuator for:

Open circuit.
Set value: approx. 0Ω .

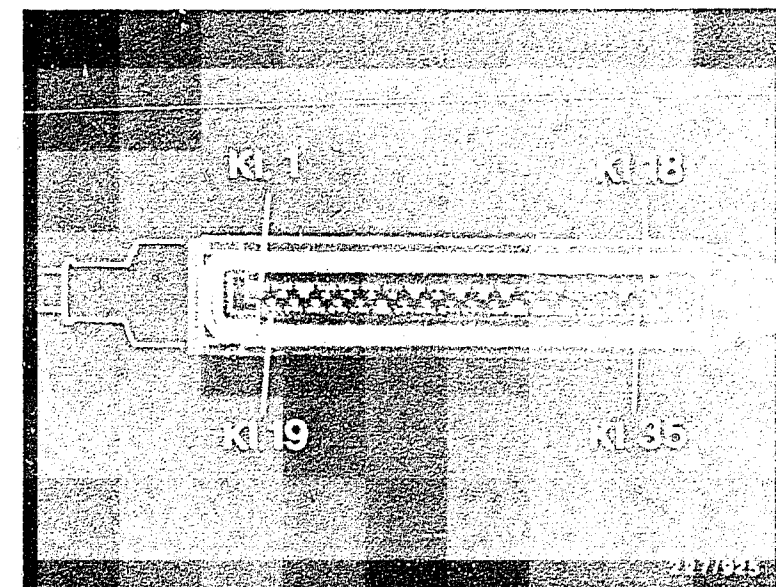
Short circuit to ground.
Set value: infinity Ω .

Eliminate any line faults.

* If above tests O.K.:

Control unit defective.

Replace control unit.



Continued on next picture page

DIAGNOIS OF FINAL CONTROL ELEMENTS (1) (CONTINUED 7)

4. Start valve:

Flashing diagnosis: 4443.

Jump contacts at relay for electric fuel pump with fuse for at least 4 seconds. Actuate throttle-valve switch and hold. Start valve is energized (rhythmic clicking noise).
Note: Energization is automatically terminated after 10 seconds.

Switch off ignition.

End of diag. of final cont. elem.

N>

Perform the following tests in the order given until the fault is found:

* Switch off ignition.

Disconnect plug from start valve and connect voltmeter between both terminals.

Trigger diagnosis of final control elements again:

Jump contacts at relay for electric fuel pump with fuse. Switch on ignition and disconnect fuse after at least 4 seconds. (Triggering of pressure actuator).

For energization of start valve, insert fuse three further times for at least 4 seconds.

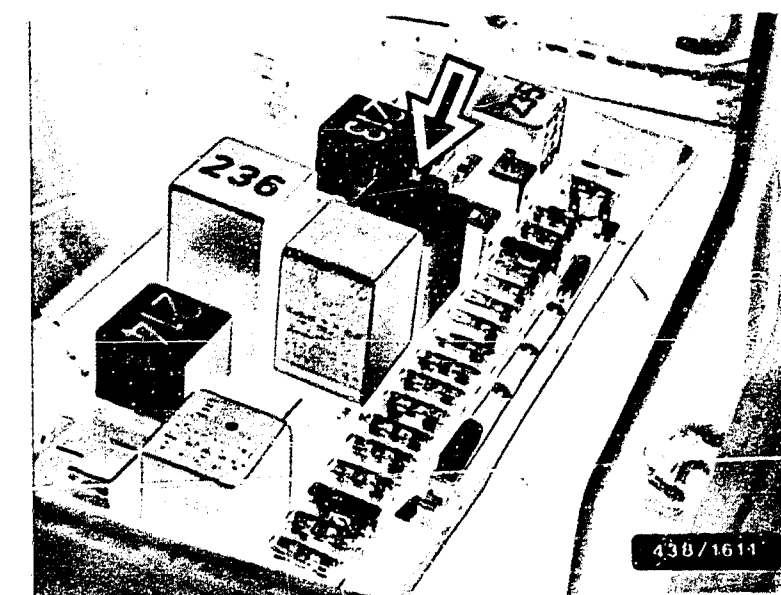
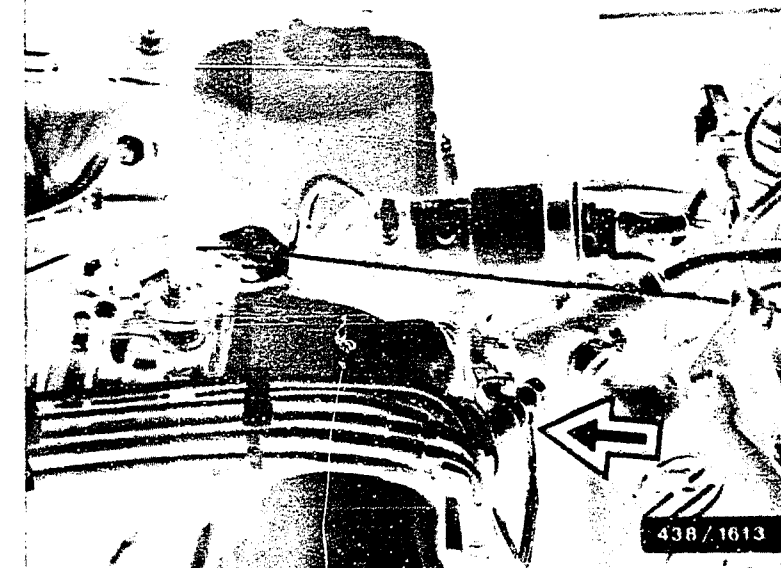
Actuate full-load throttle-valve switch, hold and read off voltmeter immediately. Indication in rhythmic sequence: battery voltage (max. 10 seconds).

If energization O.K.: start valve mechanically defective.

Replace start valve.

Return to trouble-shooting chart B03

Continued on next picture page





- * Resistance measurement directly at the two terminals of the start valve.

Set value: see vehicle-specific brief instructions.

If measured value not within tolerance: replace start-valve.

- * Check power supply at plug of start valve to ground with ignition on.

Set value: battery voltage.

- * Switch off ignition. Disconnect plug from control unit. Using ohmmeter, check lead from term. 16 to plug of start valve for:

Unterbrechung.

Set value: approx. 0Ω .

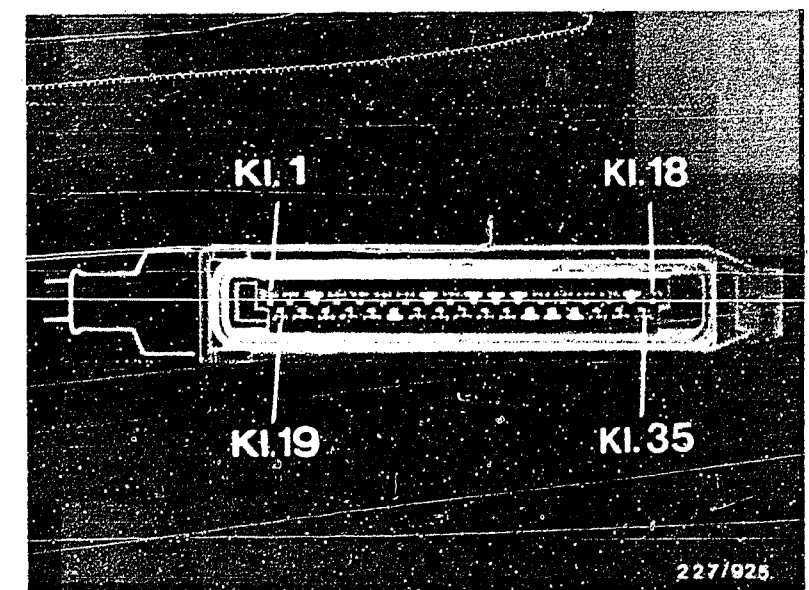
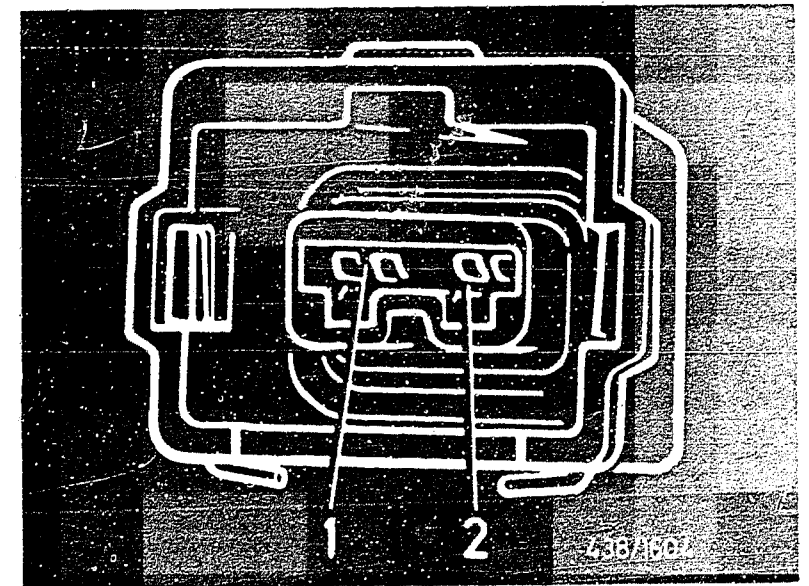
Short circuit to ground.

Set value: infinity Ω .

Eliminate any line faults.

- * If above tests O.K.:

Control unit defective.
Replace control unit.



TROUBLE-SHOOTING PROGRAM (1)

Check air-intake system of engine for leaks:

The arrows in the picture indicate the typical points at which leaks may occur. Check by visual examination or, if unsure, as follows:

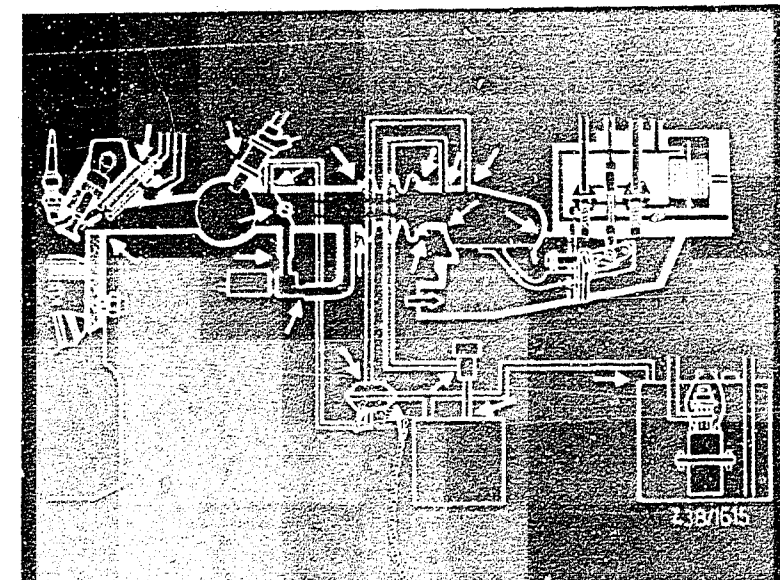
Disconnect hose from outlet of idle actuator and, using a compressed-air gun, blow air into the air-routing system through this hose. Open throttle-valve fully when doing this. Brush or spray joints with soapy water or with leak-detector spray (e.g. GUpoflex).

Under no circumstances may combustible liquids be used for testing for leaks.

Bubbling or foaming indicates a leak.

Air-intake system leak-tight?

Eliminate leaks in air-intake system.



Return to trouble-shooting chart B03

TROUBLE-SHOOTING PROGRAM (2)

Check control lever in air-flow sensor and control plunger in fuel distributor for freedom of movement:

Important:

* Engine temp. above 20°C.

* Control plunger under pressure (briefly switch on fuel pump by jumping the safety circuit).

1. Control lever:

Raise air-flow sensor plate by hand and release. Plate jumps back into zero position and jumps off the spring-loaded stop about two more times.

N>

If stiff, first of all loosen all air-flow sensor fastening screws in order to detect whether housing distortion is the cause. If this eliminates stiffness, replace seal between air-filter housing and air-filter sensor (Audi service part).

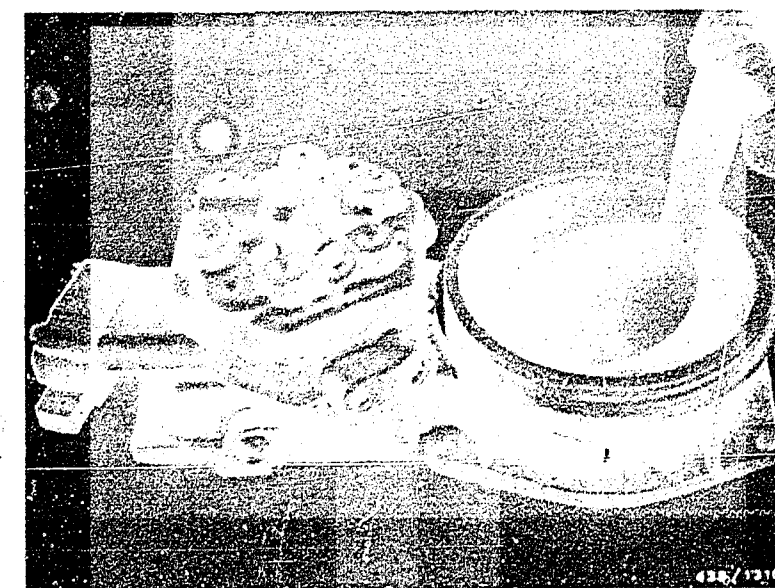
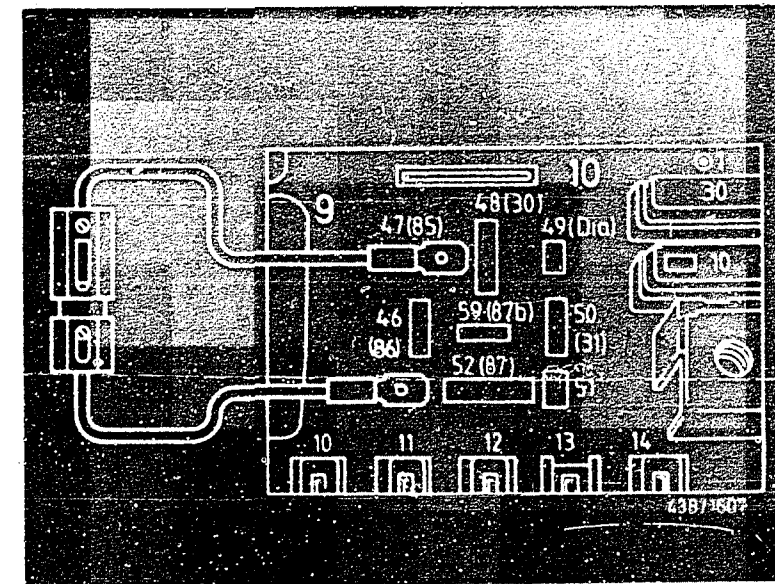
When installing, do not apply any sealing compound between the sealing surfaces.

Tightening torque for air-flow sensor fastening screws = 9...10 Nm.

If housing distortion is not the cause, replace air-flow sensor.

Repair of air-flow sensor is not possible with KE-Jetronic!

Continued on next picture page



TROUBLE-SHOOTING PROGRAM (2) CONTINUED (1)

2. Control plunger:

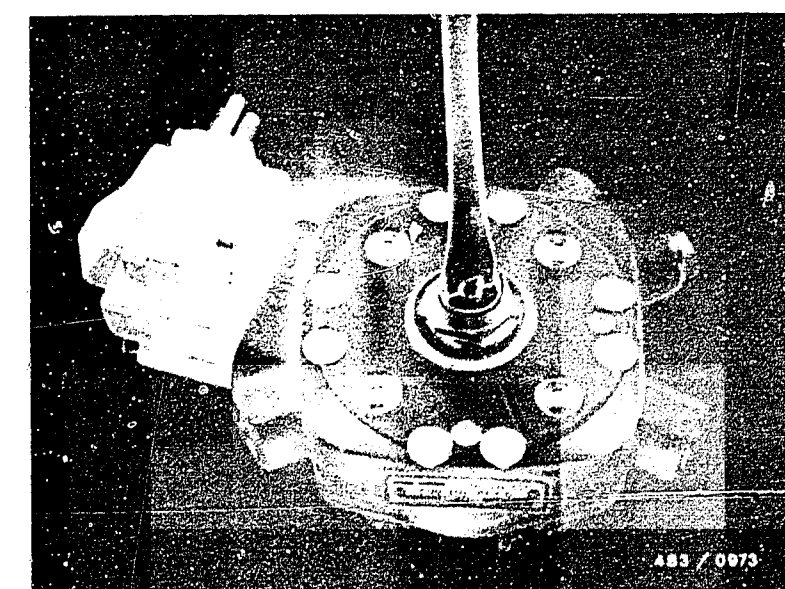
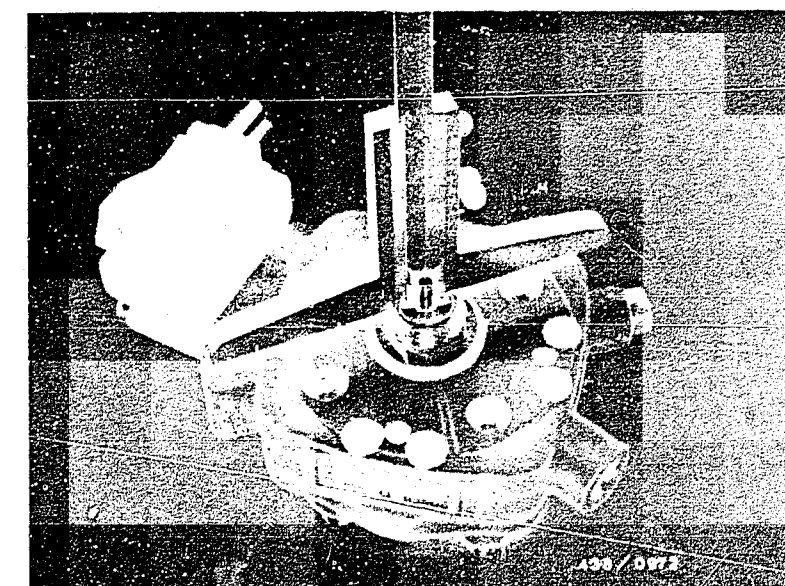
Raise sensor plate by hand. Uniform resistance must be felt over the entire travel. Move sensor plate back quickly to just before the zero position. The plunger slowly follows this movement and must be felt to come to rest on the control lever.

N>

If control plunger stiff, remove fuel distributor from air-flow sensor. To do this, thoroughly clean fuel distributor in area of fuel connections and unscrew all connections. When loosening and subsequently tightening the fuel lines, hold the fixed hexagonal section of the component with a wrench. Unscrew three fastening screws and remove fuel distributor.

Using a depth gauge, measure position of lower slotted round nut of plunger seal in relation to hexagon nut, and note down. In addition, mark rotary position of slotted round nut. Unscrew slotted round nut and remove plunger.

Clean plunger with benzine or similar. If plunger has severe score marks or if freedom of movement cannot be obtained by cleaning, replace fuel distributor. Mechanical cleaning of plunger is not allowable.



Continued on next picture page

Continued on next picture page

↓

After installing the control plunger in the fuel distributor, screw in slotted round nut of plunger seal as far as the position noted when removing, and turn to the marked position.

Mount fuel distributor with new seal ring on air-flow sensor. Tightening torque for the three fastening screws: 3.2...3.8 Nm

↓

Continued on next picture page

Centering the sensor plate:

Check whether the sensor plate is flat (not bent) and whether it can move through without contact at the narrowest point of the air funnel.

N>

Replace bent sensor plate or re-center sensor plate:

Loosen fastening screw:

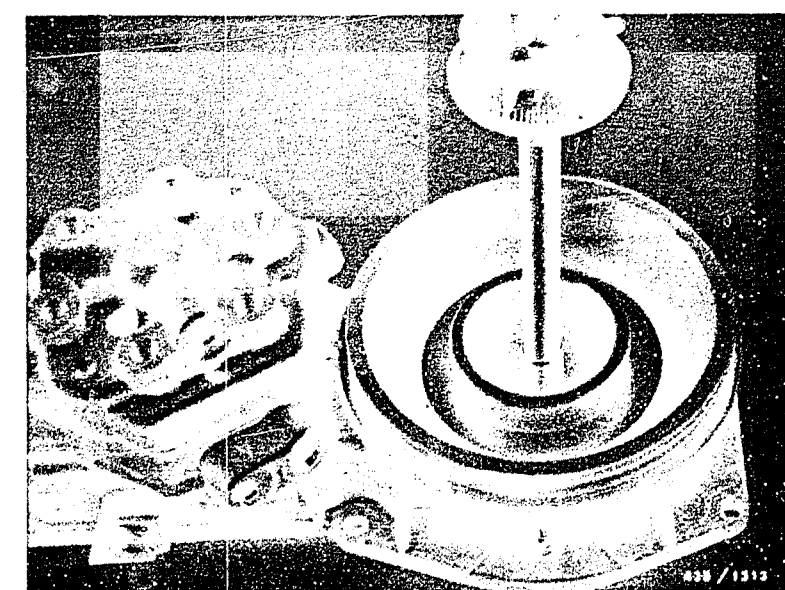
Caution: to lock it, the screw was micro-encapsulated at the factory and is therefore difficult to loosen and turn. If screw is very tight, do not turn by force, but heat with a large soldering iron or with a hot-air fan.

DO NOT USE AN OPEN FLAME!

Center air-flow sensor plate with locating ring KDEP 1040/10 (80 mm) as follows:

Insert sensor plate with locating ring so that it is in the cylindrical area of the air funnel. Tighten fastening screw to 5...5.5 Nm.

Note: If the screw is very easy to turn (after being loosened several times), clean it and coat it with a little screw-locking compound (e.g. Loctite). Do not use too much in order to enable subsequent loosening. After tightening to the specified tightening torque, it must no longer be possible to turn the sensor plate.



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (2) CONTINUED (4)

Position of sensor plate
(zero position):
(see also sticker on sensor plate)

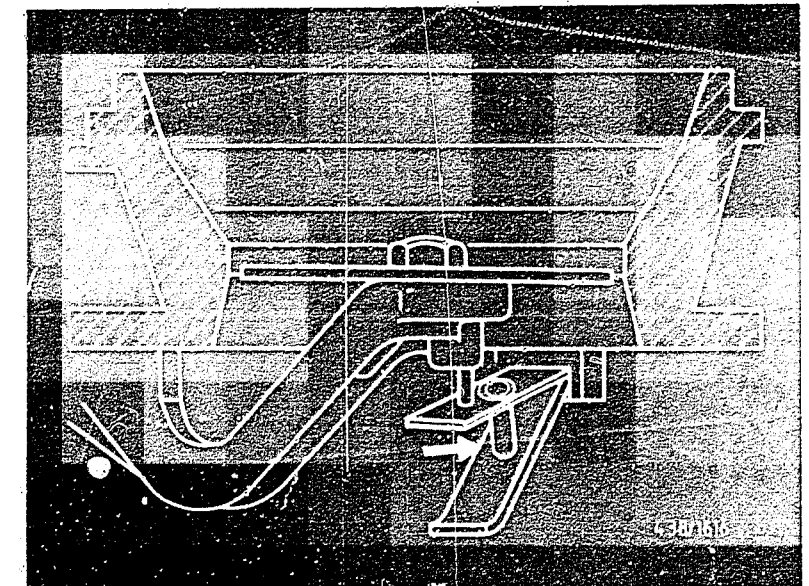
N>

The starting point for the zero position is the basic position of the sensor plate. Definition of basic position: to edge of sensor plate flush with transition edge between cylindrical area and air funnel (visual examination, see picture).

Hold sensor plate in basic position (possibly from below through air-filter housing) and, using a depth gauge, measure distance between top edge of air funnel and sensor plate (at rim, in direction of fuel distributor).

Then lower sensor plate as far as stop spring. This "zero position" should be lower than the basic (position according to the value on the sticker (e.g. $1.9 + 1.1\text{mm}$)).

If necessary, correct the position of the stop spring and thus the zero position by turning the adjusting screw in the lower sensor-plate stop bracket (see arrow, picture).



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (2) CONTINUED (5)

Free travel of air-flow sensor plate:

Briefly switch on electric fuel pump by jumping the safety circuit, so that pressure is applied to the control plunger.

With the zero position correctly adjusted and the idle adjustment approximately correct, the control plunger must not rest on the needle bearing in the control lever. Check: slightly raise the sensor plate. The control lever must cover a free travel between zero position and point of contact with control plunger. This travel must be able to be felt up to max. 2 mm at the center of the sensor plate.

N>

To adjust the free travel, remove fuel distributor and screw in or out the slotted round nut of the lower plunger seal.

Changing the screw-in depth by 0.1 mm results in approx. 0.7 mm at the center of the sensor plate.

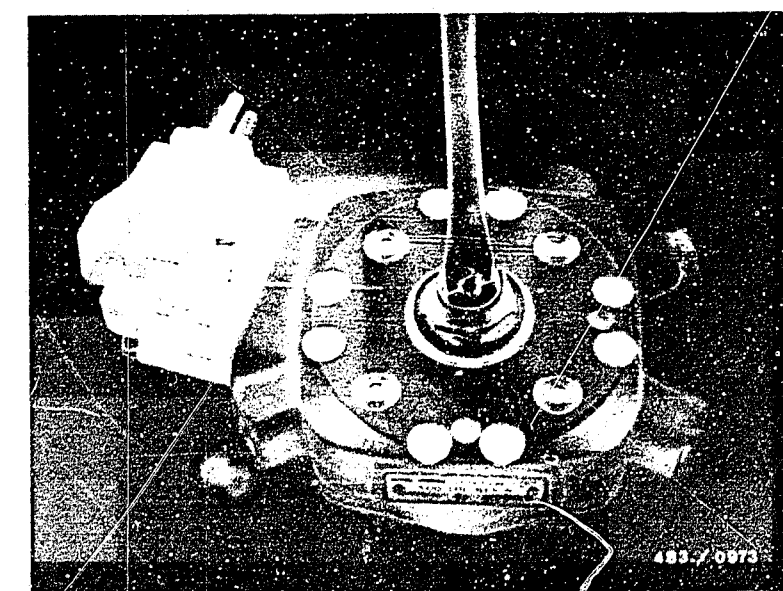
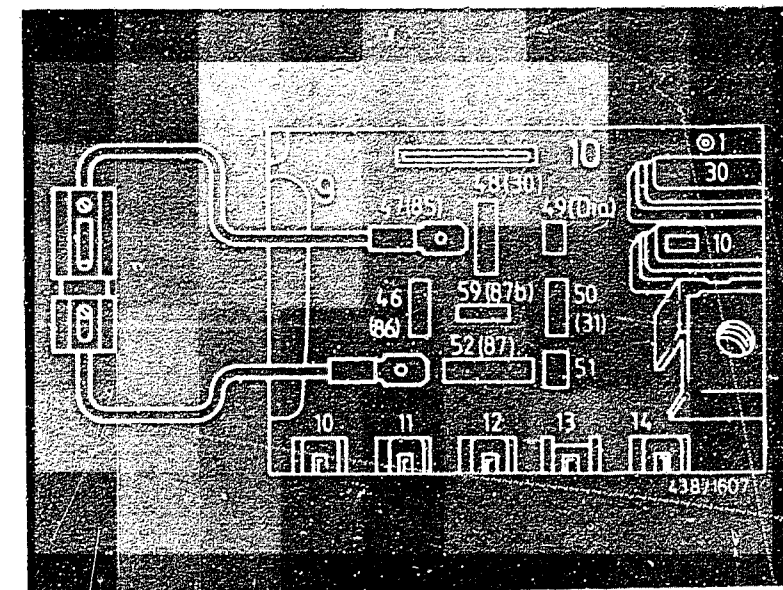
Special case:

Should it happen that the slotted round nut of the plunger seal and the idle-mixture-adjusting screw are both out of adjustment by an unknown amount, it is possible that the free travel may be reduced to zero or may be much too great. In this case, make an adjustment as follows:

Remove fuel distributor and turn back slotted round nut, flush with collar of hexagon nut. On the air-flow sensor, using a depth gauge, adjust the dimension between fuel-distributor support surface (threaded eyes) and needle bearing in control lever (control lever in rest position) to 21.2...21.4 mm by adjusting the idle-mixture-adjusting screw. Mount fuel distributor; there is now no free travel.

Return to trouble-shooting chart B03

Continued on next picture page





Let engine warm up and make
idle adjustment(Coordinate ...).

Remove fuel distributor again
and screw in slotted round nut
deeper by approx. 0.6 mm.
Mount fuel distributor; connect
only fuel inlet, both returns
and start-valve line.

With the electric fuel pump
operating, check the free
travel, possibly adjusting
the slotted round nut appro-
priately with fuel distributor
once again removed.

Connect all lines to fuel
distributor. Check idle adjust-
ment again, correcting if
necessary (Coordinate H 11).

TROUBLE-SHOOTING PROGRAM (3)

Check electric fuel pump energization (safety circuit) and operation:

1. Energization (safety circuit):

After ignition has been switched on, the electric fuel pump must operate for approx. 1 second and must then stop unless the engine is then started immediately. After starting, the pump must continue to operate. This safety function is determined by the EI-K control unit, which energizes the pump relay.

N>

Perform the following tests in the order given until the fault is found:

* Line connections at relay base:

Voltage measurements:

Term.30 = Battery voltage

Term.15 - Ignition on = battery voltage.

Measure resistance between:

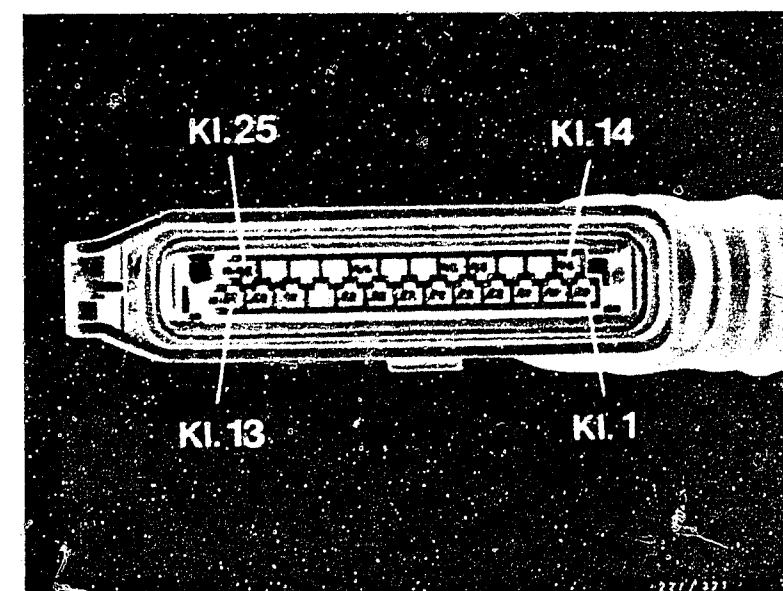
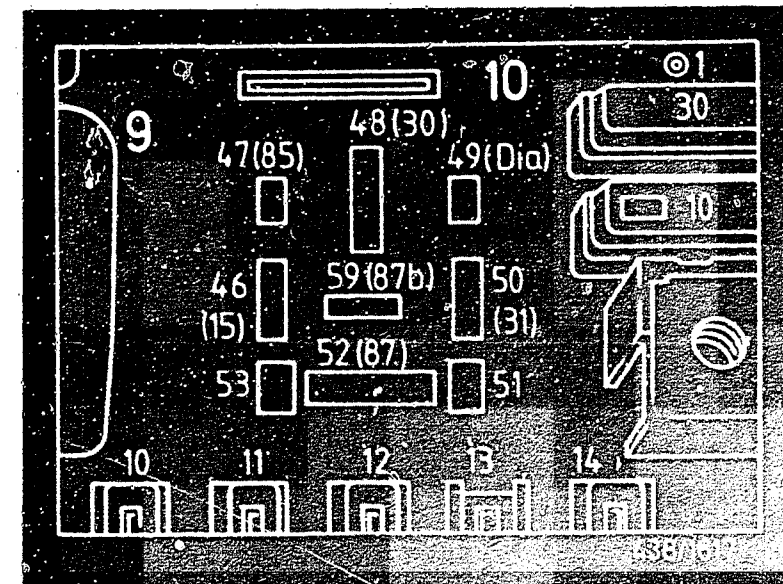
Term. 87 and plug of electric fuel pump (at sensor for fuel gauge) = approx. 0 Ω

Ground lead from plug of electric fuel pump and vehicle ground = approx. 0 Ω .

Switch off ignition and disconnect plug from EI-K control unit.

Term.85 and plug of EZ-I control unit, term.14 = approx. 0 Ω

Eliminate any line faults.



Continued on next picture page

Continued on next picture page

* If there are no line faults:

Jump term. 30 and 87 in relay base with auxiliary lead (with fuse element and 16 A fuse). Electric fuel pump must operate.

If not operating:
Electric fuel pump defective.
Replace electric fuel pump (described at end of this test step).

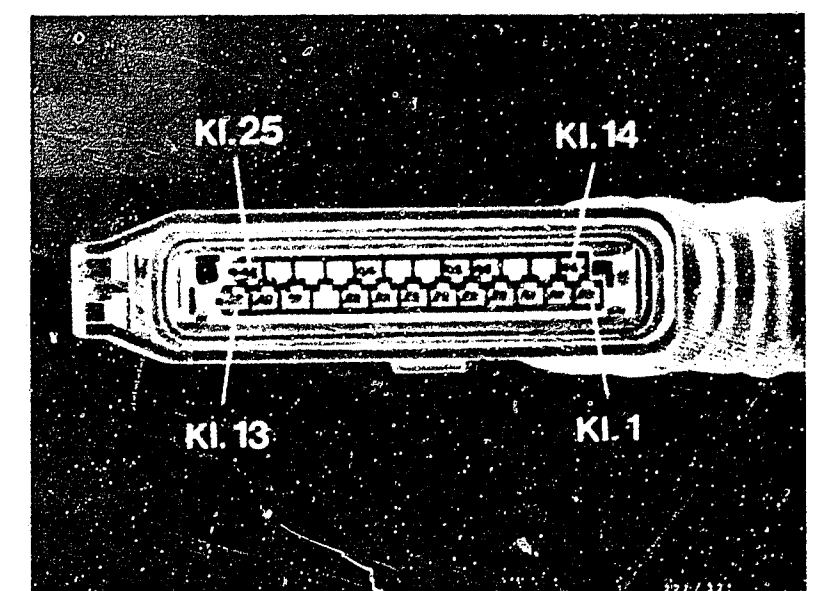
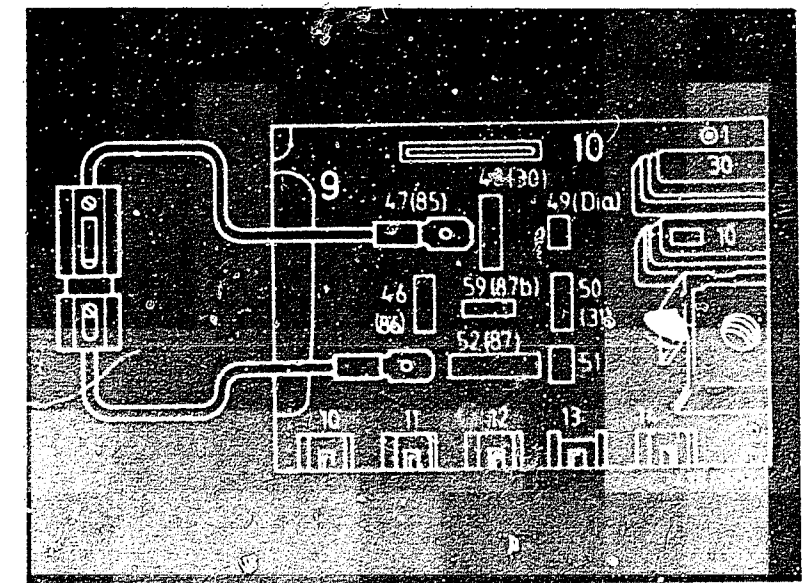
* Connect term. 14 to term 20 (ground) on plug of EI-K control unit.

Switch on ignition.

Electric fuel pump must operate.

Not operating: relay defective. Replace relay.

If O.K.: EI-K control unit defective. Replace control unit.



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (3) CONTINUED (2)

2. Check operation of electric fuel pump.

This tests the fuel delivery against primary pressure, i.e. at the fuel return line from the primary-pressure regulator to the fuel tank.

Undo screw connector in return line (arrow in top picture) and hold flexible hose end in measuring glass (approx. 1.5 liter capacity).

Switch on electric pump for precisely 30 seconds by jumping the safety circuit, and measure fuel delivery in measuring glass.

Set value: see vehicle-specific breif instructions.

Set value obtained?

N>

Possible causes of fuel delivery being too low:

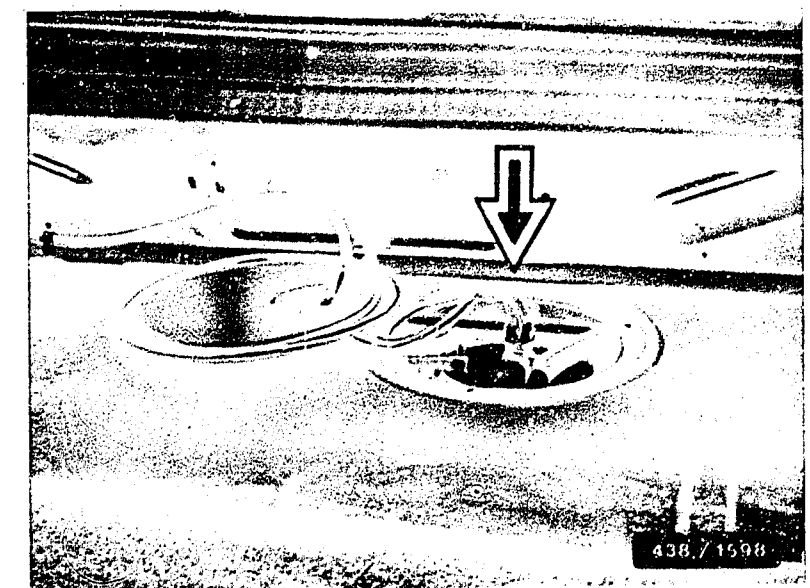
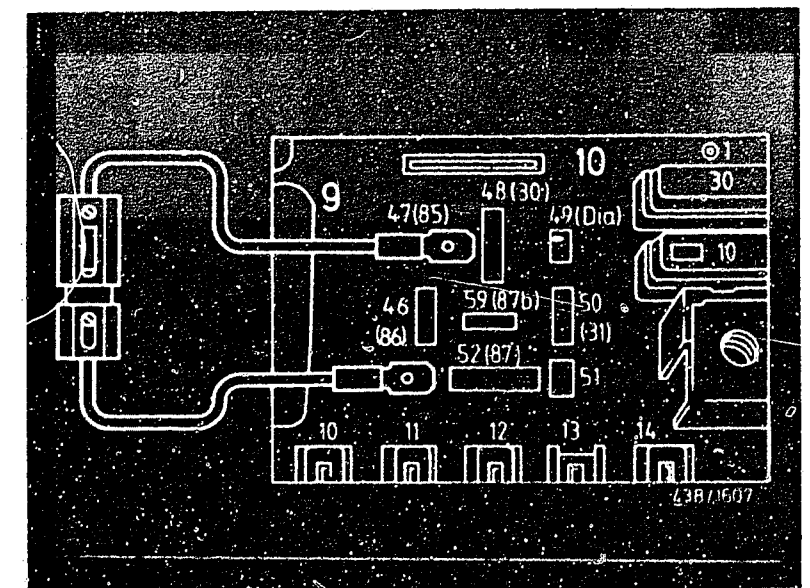
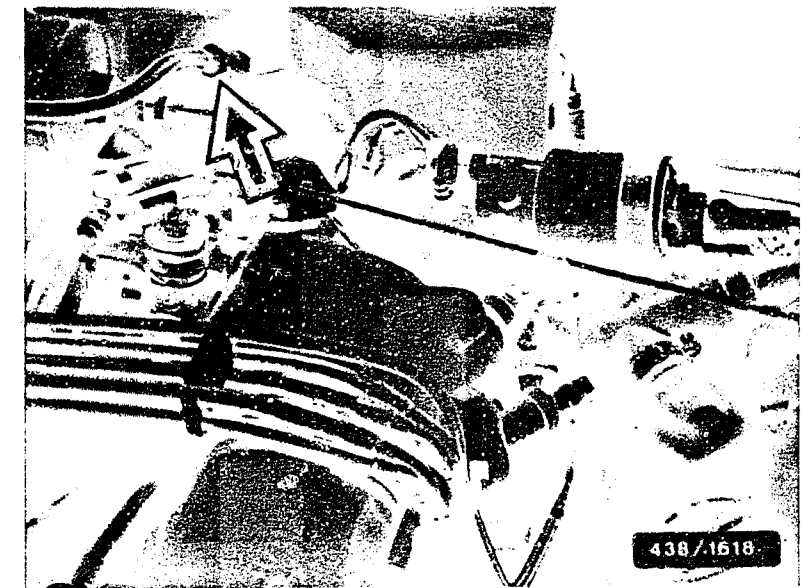
- * Power supply to electric fuel pump not O.K.; voltage drop. Perform voltage measurement with pump operating directly at the plug (at sensor for fuel gauge, use test prods).

Set value: Minimum voltage 11.5 V.

- * Fuel filter very dirty.
- * Strainer in double screw connection of fuel-distributor inlet clogged (visual inspection). Clean/renew strainer.

Note:
Strainer was only introduced as standard as of approx. 1989.

If the above points are O.K., the cause lies with the electric fuel pump itself. Replace pump.



Return to trouble-shooting chart B03

Continued on next picture page

V

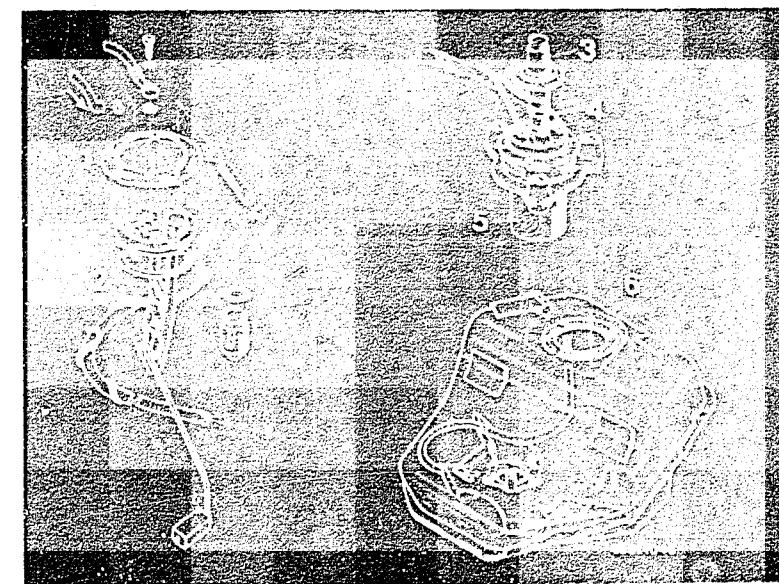
Removing and installing the electric fuel pump (in-tank pump):

Take out mat in luggage compartment. Unscrew round closing cover. On sensor for fuel gauge, unscrew delivery line 1, remove return line 2 and vent line 3. Loosen clamping ring and remove sensor assembly.

Withdraw the completely assembled pump unit out of the latching springs in the bottom of the fuel tank.

Replace electric fuel pump in holder. To connect the inlet union on the tube fitting, use new seal rings.

Install in reverse order, paying attention to correct positioning of electric fuel pump and of fuel lines. Replace steel ring on flange of sensor for fuel gauge (Audi service part).



- 1 = Closure ring
- 2 = Sensor for fuel gauge
- 3 = Pressure damper
- 4 = Non-return valve
- 5 = Electric fuel pump
- 6 = Fuel tank

TROUBLE-SHOOTING PROGRAM (4)

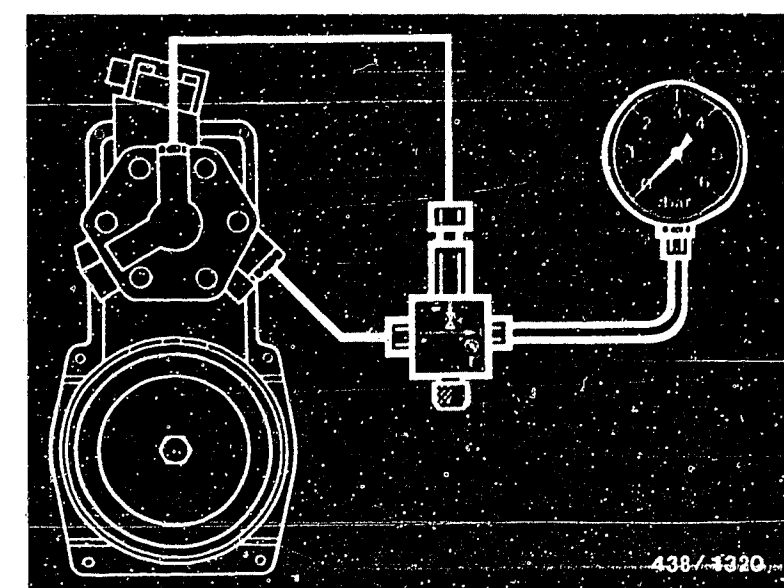
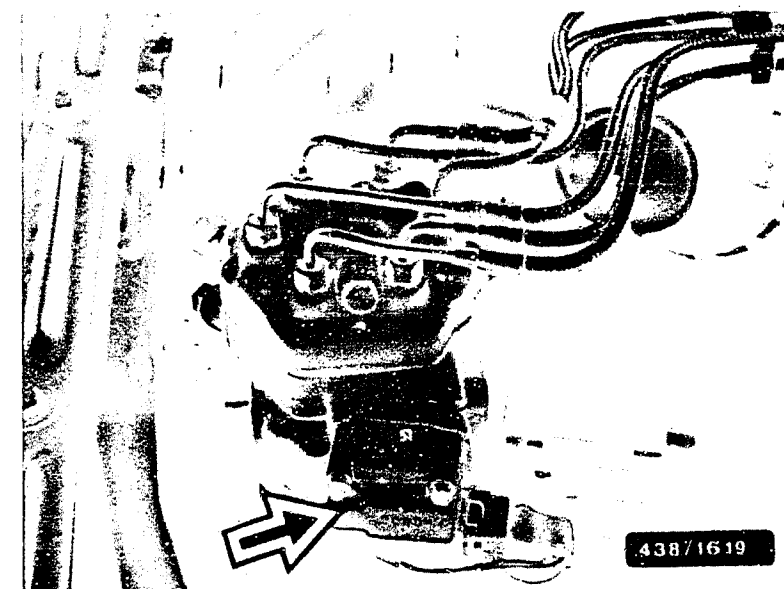
Checking the primary pressure:

Mount pressure tester
KDJE-P 100 using connecting-
parts sets KDJE-P 100/10 and
.../11.

Caution: for the connection
of the pressure tester, the
fuel distributor has two
special measuring ports which
are closed with screw plugs.
(Arrows). To reduce the
residual primary pressure,
always loosen the upper
screw plug first, then the
lower one.

Connect connection "A" of the
directional-control valve to
the lower measuring port with
double threaded fitting M8 x 1/
M 12 x 1.5 from KDJE-P 100/10.

Connect connection "B" to the
upper measuring port with hose
line from KDJE-P 100/11.



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (4) CONTINUED (1)

Checking the primary pressure:

Open valve screw on directional-control valve (turning counter-clockwise).

Switch on electric fuel pump by jumping the safety circuit.

Pressure gauge of pressure tester indicates primary pressure.

Set value: see vehicle-specific brief instructions.

Set value obtained?

N>

Possible causes of primary pressure being too low:

* Fuel supply not O.K. Fuel delivery of electric fuel pump too low.

Measure fuel delivery at return connection of pressure regulator.

Set value: see vehicle-specific brief instructions.

* Primary-pressure regulator (diaphragm-type pressure regulator) not O.K.. Replace pressure regulator.

Possible causes of primary pressure being too high:

* Fuel return to fuel tank constricted. To check, lead return from pressure regulator into a separate container. Eliminate any constriction.

* Primary-pressure regulator (diaphragm-type pressure regulator) not O.K.. Replace pressure regulator.

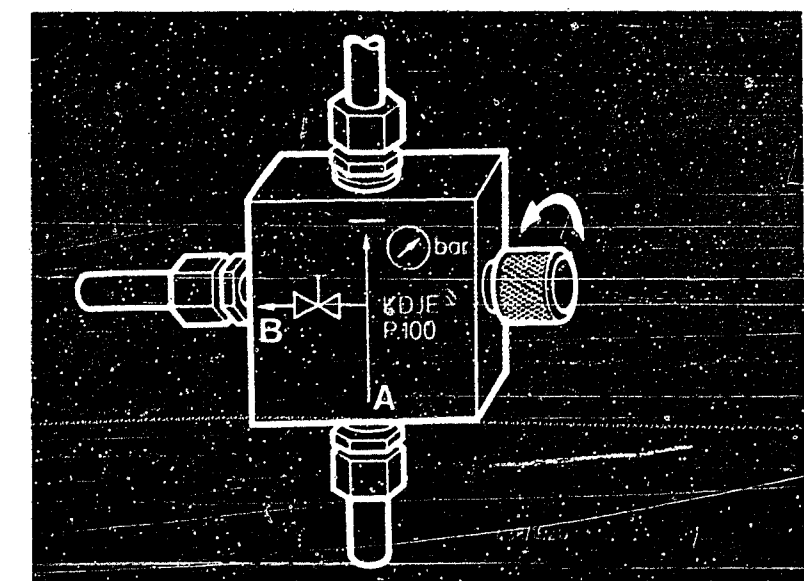
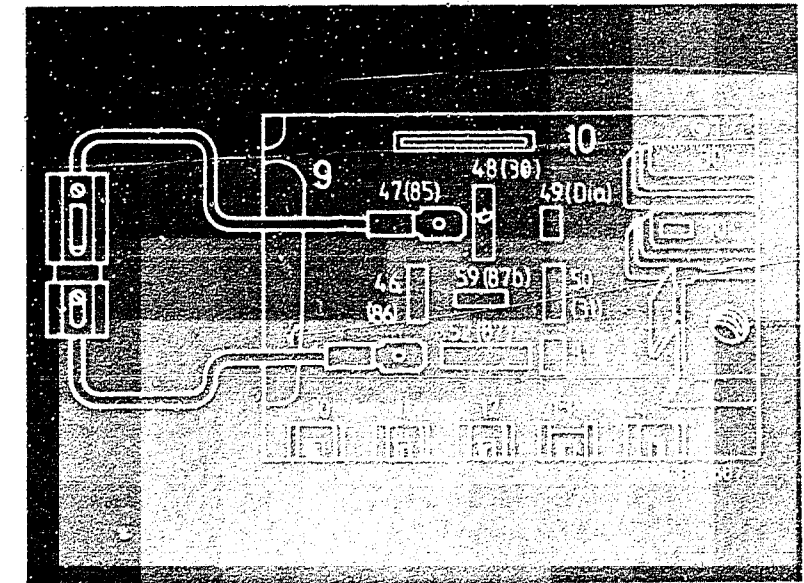
Return to trouble-shooting chart B03

F07

<=>

F08

<=>



Testing of electrohydraulic pressure actuators and differential pressures:

Note: on the KE-Jetronic, all fuel-delivery adjustments are formed by differential-pressure control as a function of the operation of the pressure actuator.

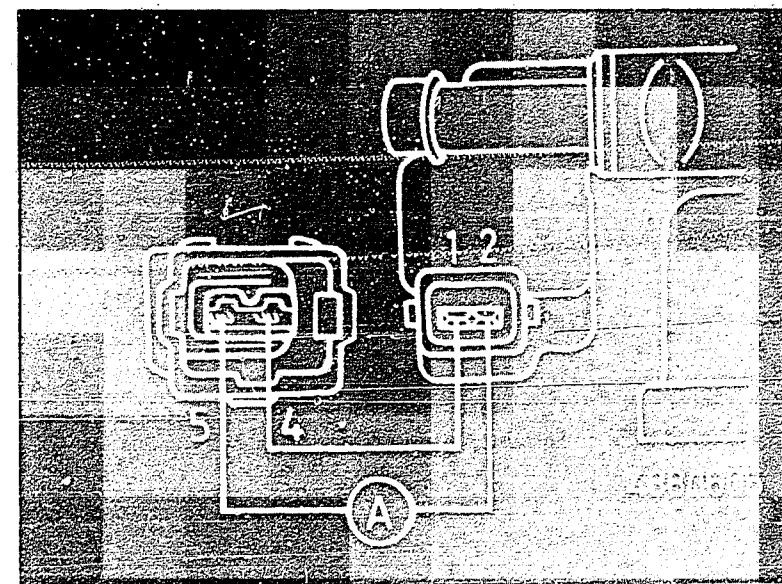
Differential pressure = difference between primary pressure and pressure in lower chambers of differential-pressure valves.

The correct operation of the pressure actuator, presupposes that the electrical energization – and the pressure actuator itself – are electrically O.K..

1. Electrical test:

Connect ammeter to pressure regulator:

Disconnect plug from pressure actuator. Using auxiliary lead, re-connect lead term. 1, connect ammeter to term. 2 between pressure actuator and plug (test leads KDZS 0004 and KDUM 0008).



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (5) CONTINUED (1)

Set ammeter to 200 mA measuring range.

Switch on ignition.

Reading: 90...110 mA

N>

Perform the following tests in the order given until the fault is found:

- * Measure resistance directly at the two terminals of the pressure actuator.

Set value: 16...22 Ω .

If measured value not within tolerance: replace pressure actuator.

To do this, clean fuel distributor in area of pressure actuator; unscrew pressure actuator. Always mount new pressure actuator with new seal rings and genuine fastening screws (non-metal steel).

- * Switch off ignition. Disconnect plug from control unit. Using ohmmeter, check the leads from term. 4 and 5 to plug of pressure actuator term. 1 and 2 for:

Open circuit.

Set value: approx. 0 Ω .

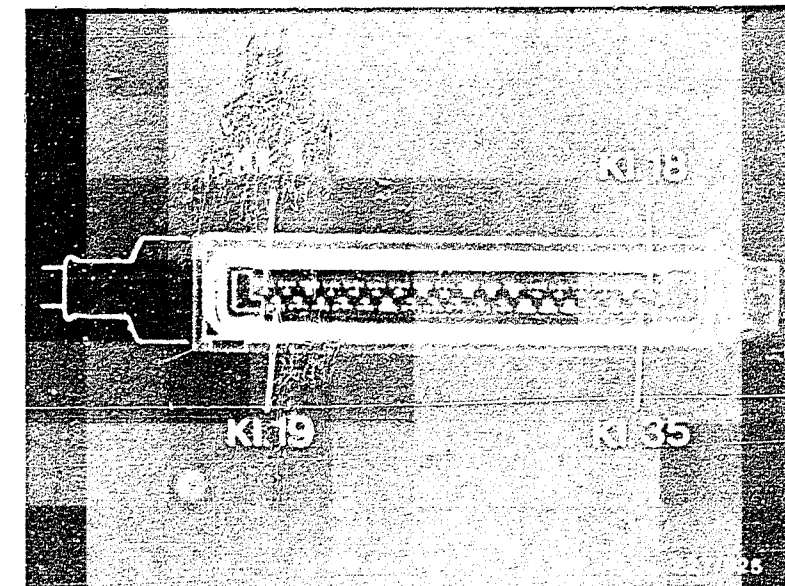
Short circuit to ground.

Set value: infinity Ω .

Short circuit between both leads.

Set value: infinity Ω .

Eliminate any line faults.



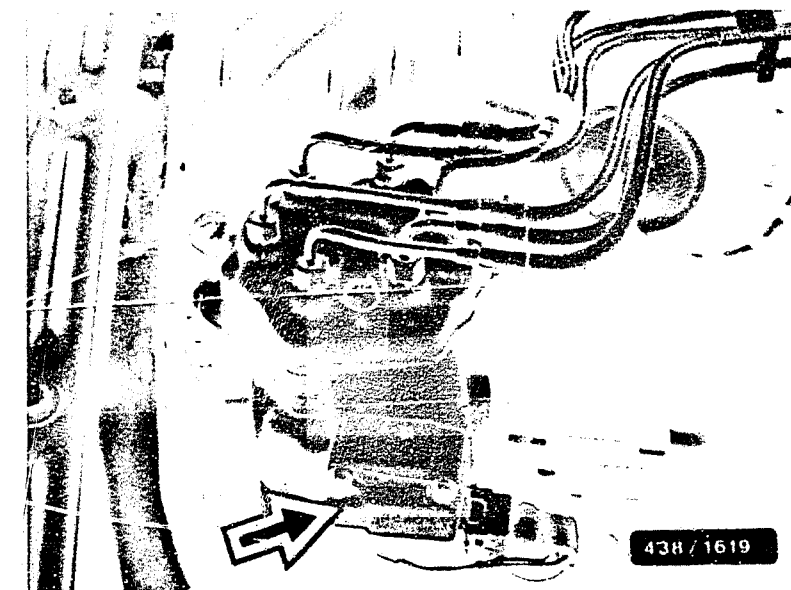
Continued on next picture page

Continued on next picture page

* If both above tests O.K.:

Control unit defective.

Replace control unit.



2. Test of differential pressures:

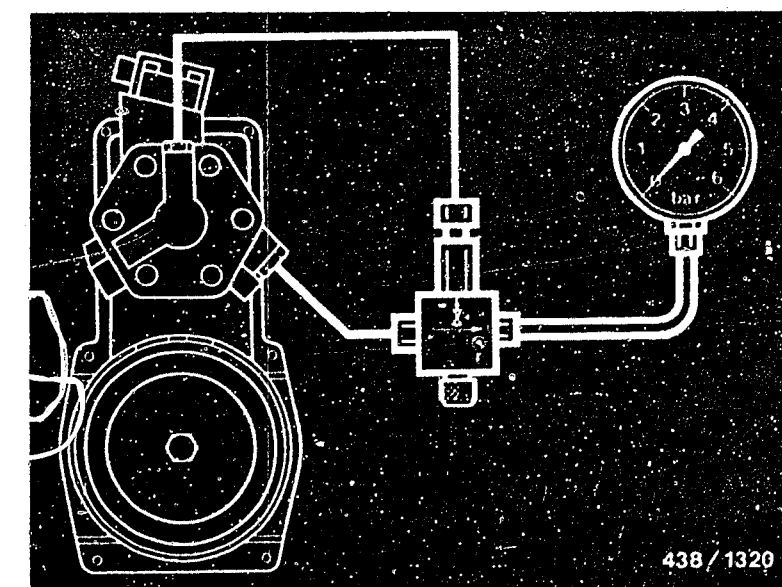
Ammeter from test 1 remains connected.

Mount pressure tester KDJE-P 100 using connecting-parts sets KDJE-P 100/10 and .../11.

Caution: For the connection of the pressure tester, the fuel distributor has two special measuring ports which are closed with screw plugs (arrows). To reduce the residual primary pressure, always loosen the upper screw plug first, and then the lower plug.

Connect connection "A" of the directional-control valve to the lower measuring port with double threaded fitting M 8 x 1/ M 12 x 1.5 from KDJE-P 100/10.

Connect connection "B" to the upper measuring port with hose line from KDJE-P 100/11.



Continued on next picture page

Testing:

(This tests the pressure difference between primary pressure and lower-chamber pressure of the differential-pressure valves in the fuel distributor)

2.1 Primary pressure:

Switch on electric fuel pump by jumping the safety circuit.

Open valve screw of directional-control valve (turning counter clockwise).

Pressure gauge now indicates primary pressure.

Set value: see vehicle-specific brief instructions.

Make a note of the meas. value. Set value obtained?

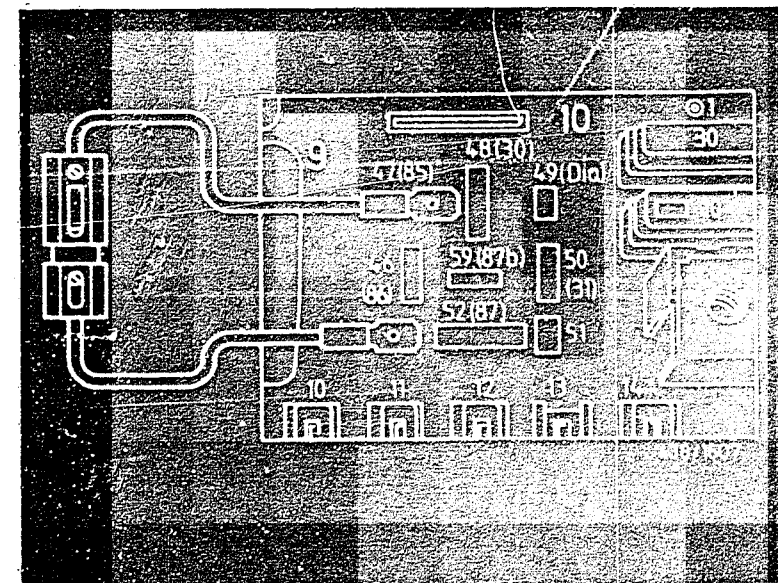
N>

Possible causes of incorrect primary pressure:

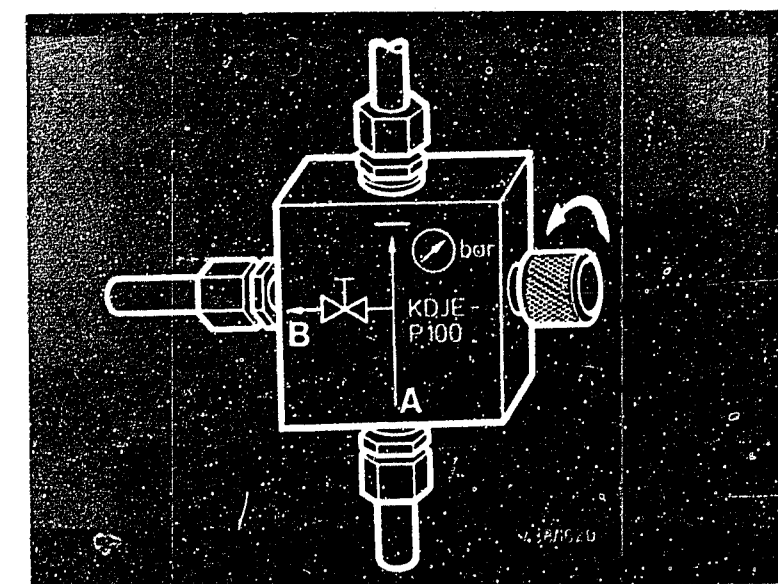
- * Fuel supply not O.K., fuel delivery of electric fuel pump too low.

Set value: see vehicle-specific brief instructions.

- * Fuel-return line to fuel tank constricted. To check, unscrew return line from primary-pressure regulator and lead return delivery into a separate container.
- * Primary-pressure regulator (diaphragm-type pressure regulator) not O.K. Replace pressure regulator.



Continued on next picture page



TROUBLE-SHOOTING PROGRAM (5) CONTINUED (4)

2.2 "Warm" lower-chamber pressure:

Switch on electric pump by jumping the safety circuit.

Do not switch on ignition, i.e. pressure actuator deenergized.

Close valve screw of directional-control valve (turning clockwise).

The pressure indicated on the pressure gauge must drop below the previously measured primary-pressure value.

Determine set value for "warm" lower-chamber pressure from graph according to the primary pressure measured – see vehicle-specific brief instructions.

Set value obtained?

N>

Possible causes of incorrect measurement result:

- * KE restriction (fuel-decoupling restriction in fuel distributor) clogged. To test, measure throughflow:

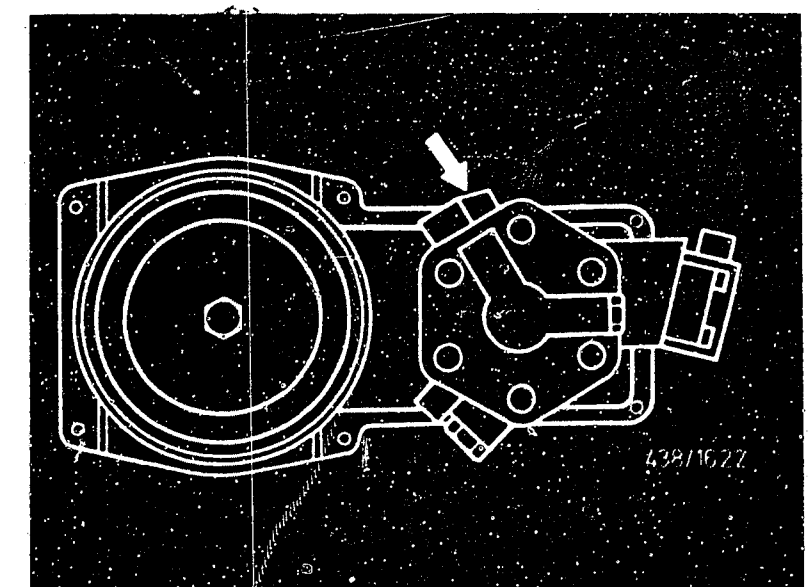
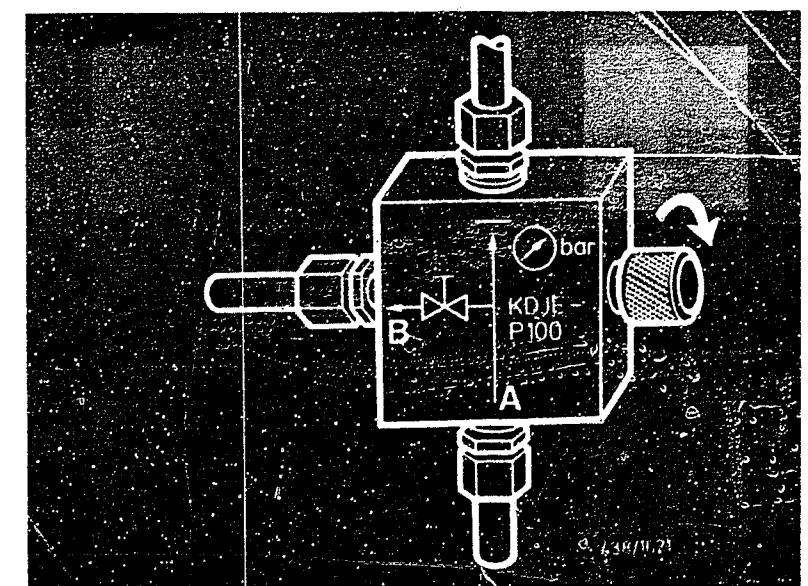
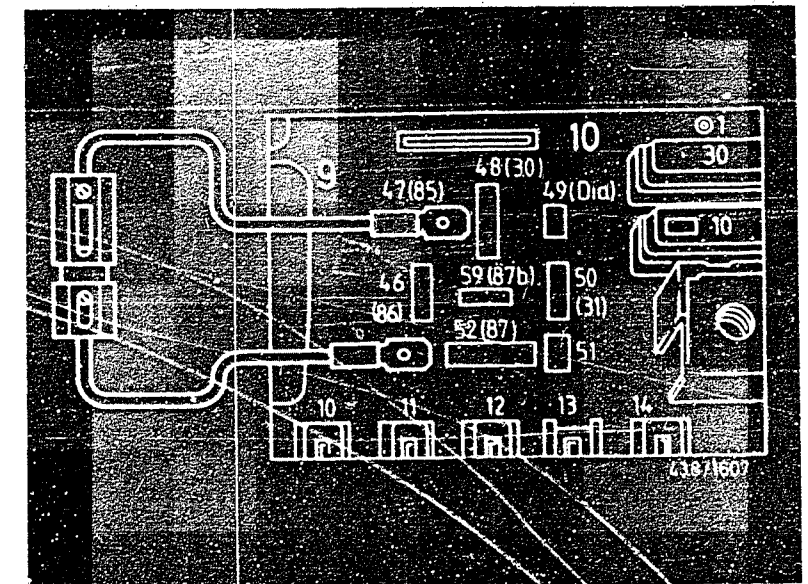
Switch off electric fuel pump.

Unscrew thin fuel line to primary-pressure regulator on fuel distributor (arrow: bottom picture). Connect hose line to free connection with ball connection M 10 x 1. Hold hose line in measuring glass.

Again switch on electric fuel pump by jumping the safety circuit and measure the overflow quantity.

Set value: see vehicle-specific brief instructions.

If the measured value differs from the set value, replace fuel distributor.



Continued on next picture page

Continued on next picture page



* Electrohydraulic pressure actuator defective.
Replace pressure actuator:

Clean the fuel distributor in the area of the pressure actuator and unscrew pressure actuator. Always mount new pressure actuator, with new seal rings and genuine fastening screws (non-magnetic steel).



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (5) CONTINUED (6)

2.3 "Cold" lower-chamber pressure:

Switch on electric fuel pump by jumping the safety circuit.

Switch on ignition so that pressure actuator is energized with static current (approx. 100 mA).

Valve screw of directional-control valve remains closed (turn clockwise).

The pressure indicated on the pressure gauge must drop below the previously measured primary pressure.

Determine the set value for "cold" lower-chamber pressure from the graph according to the measured primary pressure and the actuator current (static current) actually indicated by the ammeter – see vehicle-specific brief instructions.

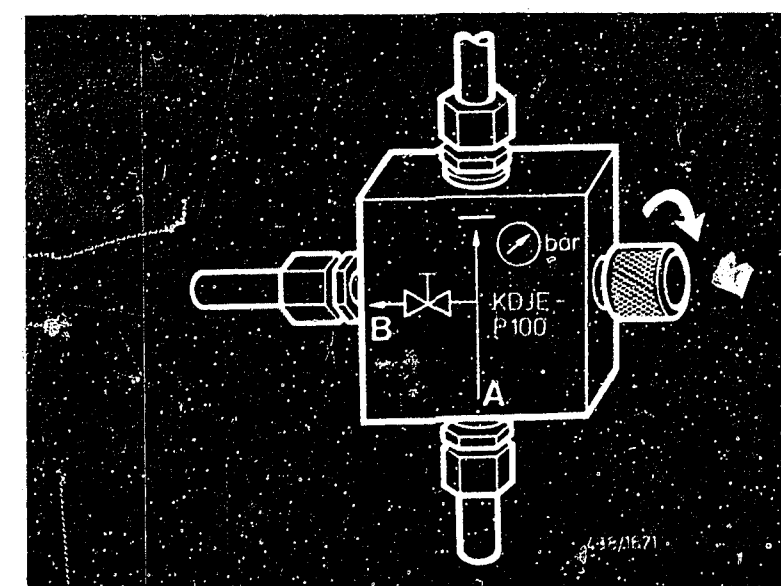
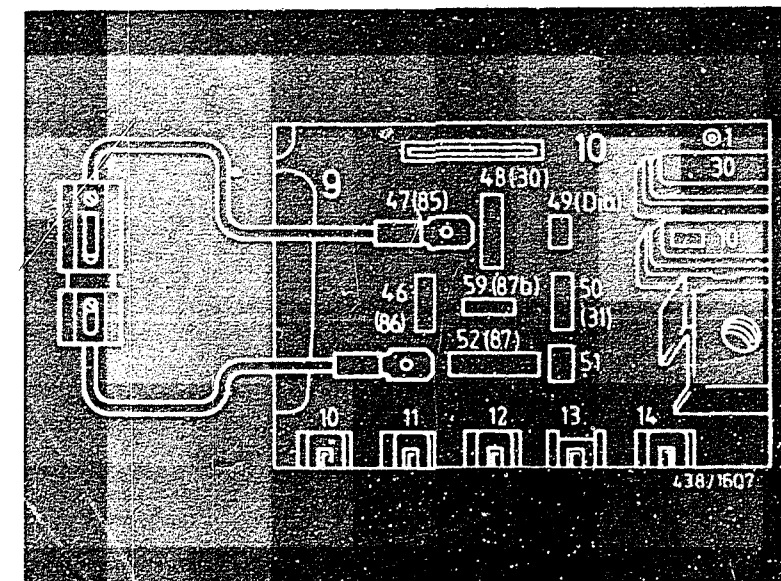
Note the tolerance of ± 0.15 bar to be added to each curve.

Set value obtained?

N>

If the required lower-chamber pressure set value is exceeded or fallen below, the cause lies with the electrohydraulic pressure actuator.
Replace pressure actuator:

Clean fuel distributor in area of pressure actuator and unscrew pressure actuator. Always mount new pressure actuator with new seal rings and genuine fastening screws (non-magnetic steel).



Return to trouble-shooting chart B03

TROUBLE-SHOOTING PROGRAM (6)

V

Check overall fuel system
for internal leaks:

Mount pressure tester
KDJE-P 100 using connecting-
parts sets KDJE-P 100/10
and .../11.

Caution: for the connection
of the pressure tester, the
fuel distributor has two
special measuring ports which
are closed with screw plugs
(arrows). To reduce the residual
primary pressure, always loosen
the upper screw plug first,
and then the lower one.

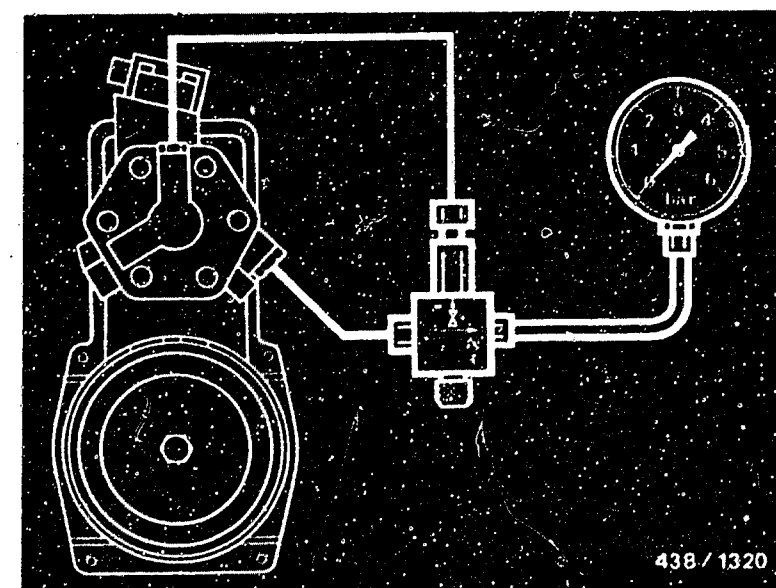
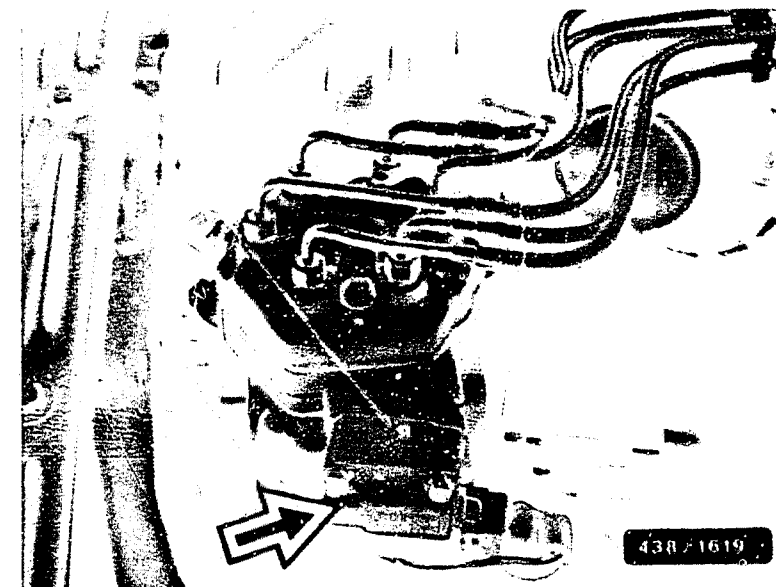
Connect connection "A" of the
directional-control valve
to the lower measuring port with
double threaded fitting
M8 x 1M 12 x 15 from KDJE-P
100/10.

Connect connection "B" to the
upper measuring port with hose
from KDEJ-P 100/11.

Y

V

Continued on next picture page



TROUBLE-SHOOTING PROGRAM (6) CONTINUED (1)

Checking for leaks:

Check with the engine stopped.

Check with engine at normal operating temperature, but not immediately after racing the engine.

Open valve screw of directional-control valve (turning counter-clockwise).

Switch on electric fuel pump by jumping the safety circuit until primary pressure has built up. Then switch off again.

Observe pressure drop on pressure gauge and measure residual pressure after test durations of 10 and 20 minutes.

Set values: see vehicle-specific brief instructions.

Set values obtained?

N>

Possible causes of leaks (pressure reduction too fast):

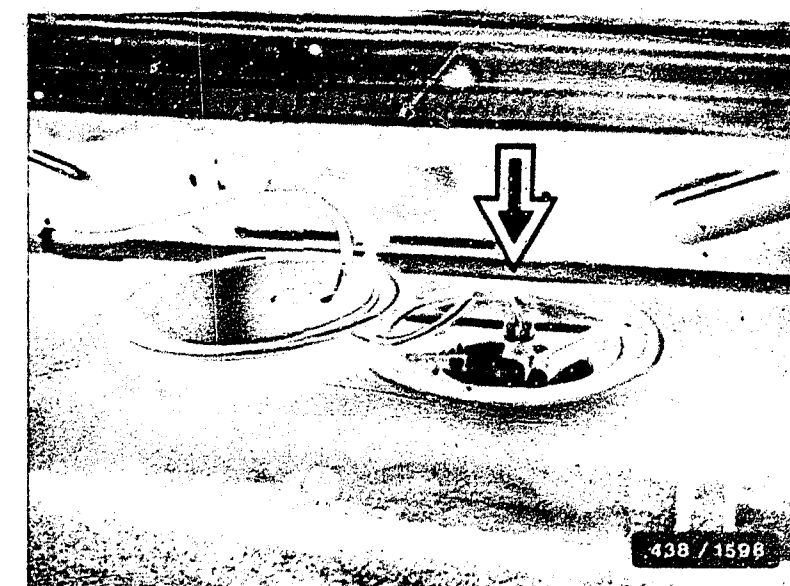
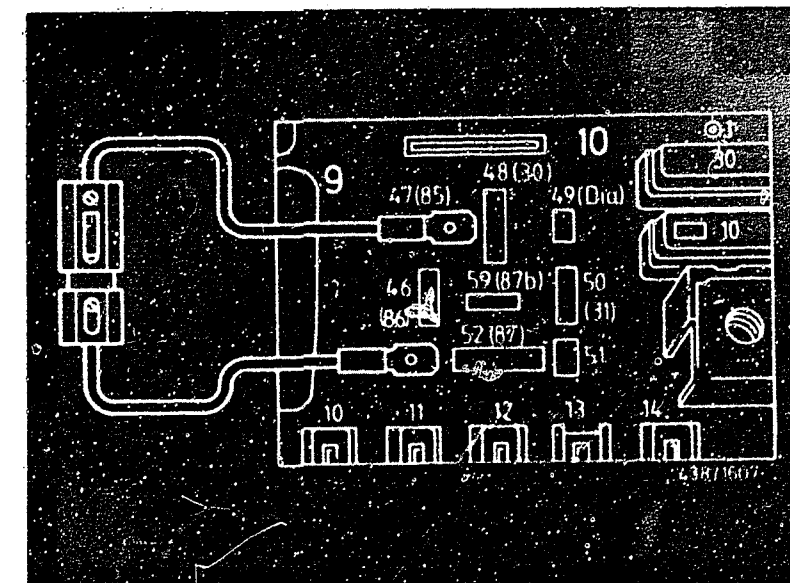
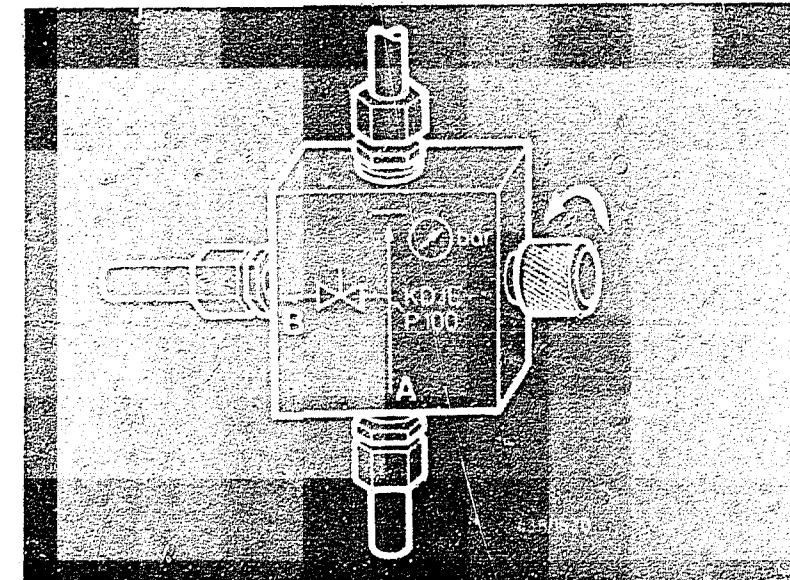
* Primary-pressure regulator (diaphragm-type pressure regulator) leaking.

To test, unscrew return line on primary-pressure regulator and seal off tight (e.g. using ball and union nut M 14 x 1.5). Repeat leak test. If leak now eliminated, replace primary-pressure regulator.

* Non-return valve in pressure-side tube fitting of electric fuel pump leaking.

Replace tube fitting assembly:

Remove mat in luggage compartment. Unscrew round closing cover (3 screws). On the sensor for the fuel gauge, unscrew delivery line 1, disconnect return line 2 and vent line 3. Loosen clamping ring and remove sensor assembly.



Return to trouble-shooting chart B03

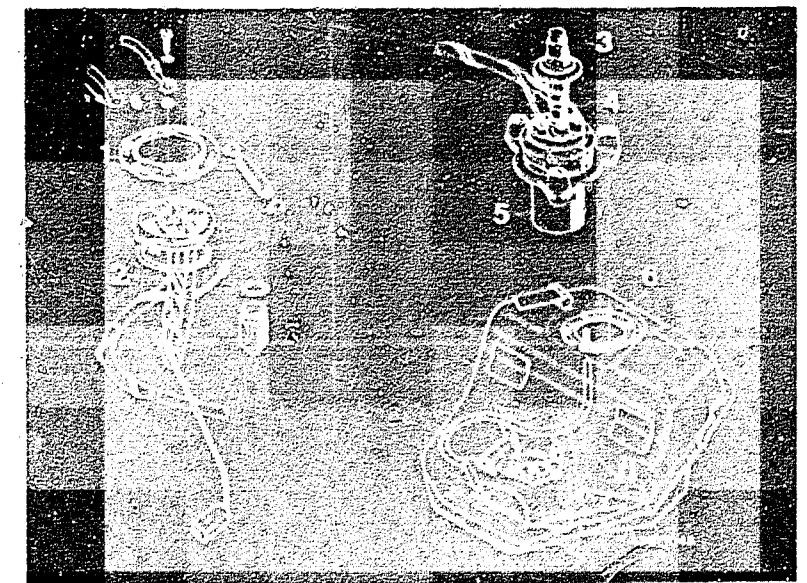
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Draw completely assembled pump unit from latching springs in bottom of fuel tank.

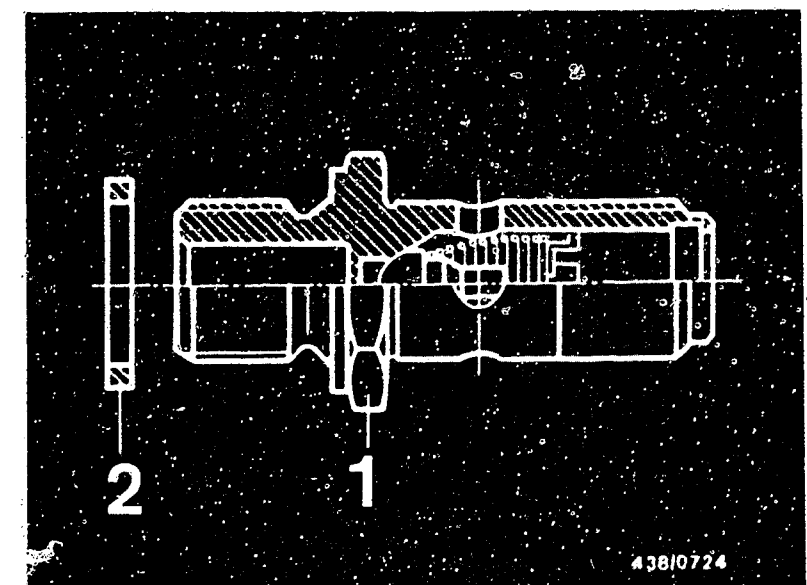
Unscrew pressure damper of electric fuel pump - hold fixed hexagonal section with a wrench - and remove inlet union from tube fitting. Unscrew tube fitting.

Screw in new tube fitting - part number 1 587 010 502 - with new seal ring and tighten to 17...25 Nm. Mount inlet union with new seal rings. Screw on pressure damper and tighten to 10...16 Nm.

Install electric fuel pump and sensor in reverse order. Pay attention to correct positioning of electric fuel pump and of fuel lines. Replace seal ring on flange of sensor for fuel gauge (Audi service part).



- 1 = Closure ring
- 2 = Sensor for fuel gauge
- 3 = Pressure damper
- 4 = Non-return valve
- 5 = Electric fuel pump
- 6 = Fuel tank



Continued on next picture page

V

* Start valve leaking.

To test, remove start valve. The fuel line remains connected. Do not kink or damage the line.

Switch on electric fuel pump by jumping the safety circuit.

Within one minute, no drop may fall from the nozzle of the start valve. Even when shaken and knocked, the start valve must not leak.

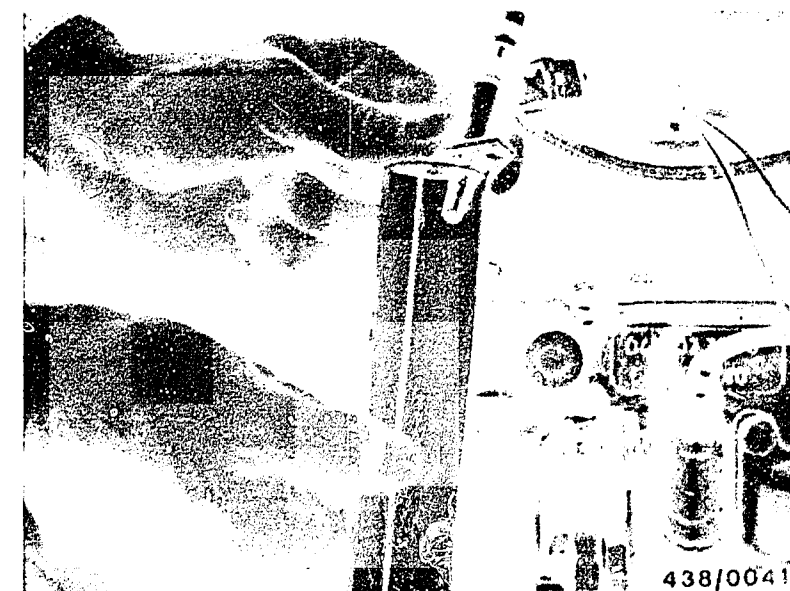
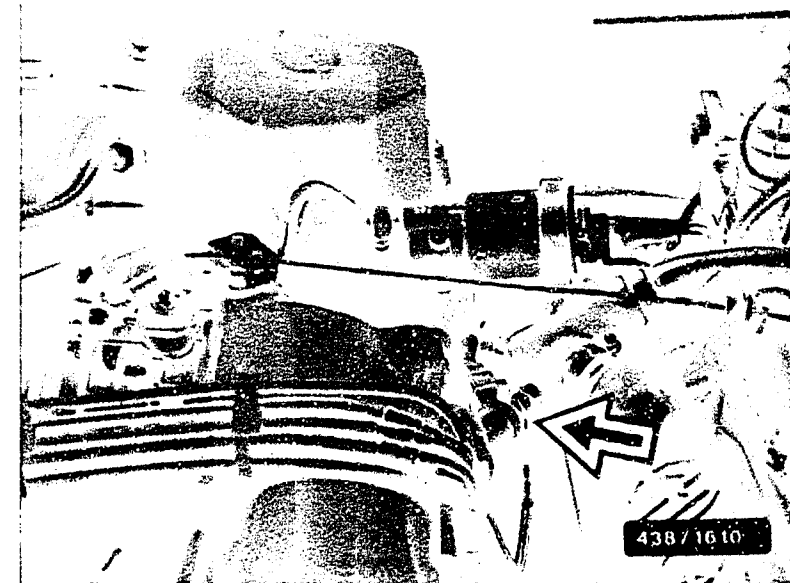
Replace start valve if leaking.

Note: if the start valve has had to be replaced because of leaking, finally check the idle adjustment and correct if necessary (Coordinate 0 00).

V

V

Continued on next picture page

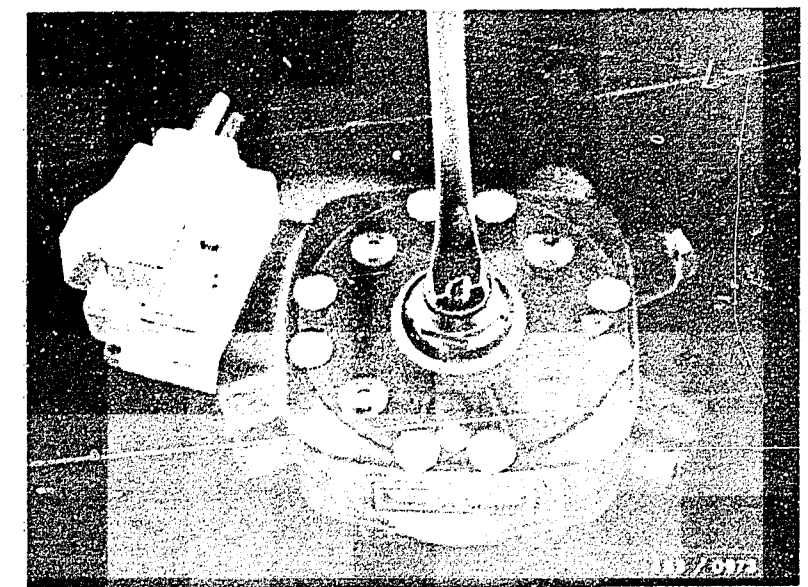
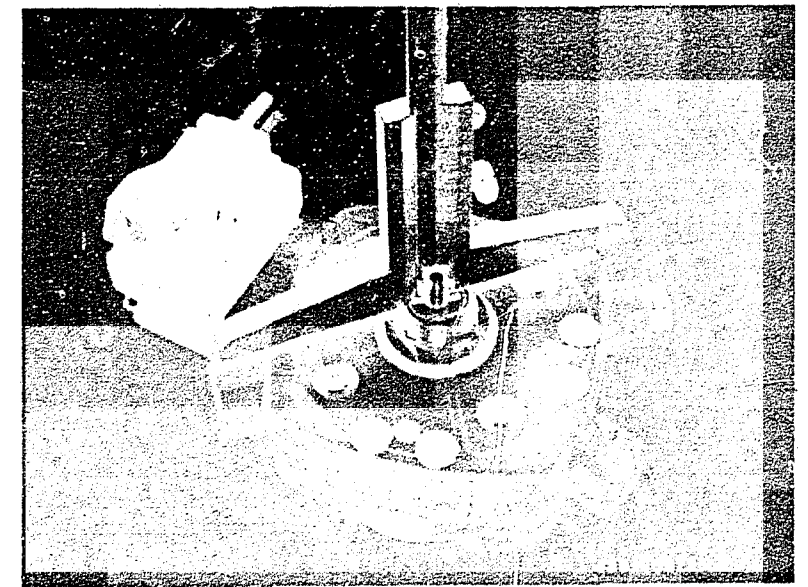


- ↓
- * Seal ring of lower plunger seal in fuel distributor leaking.

Clean fuel distributor.
Unscrew all fuel connections and unscrew fuel distributor from air-flow sensor.

Measure position of slotted round nut of plunger seal in relation to hexagon nut and note down. In addition, mark rotary position of slotted round nut.

Unscrew slotted round nut with pin-type screwdriver and carefully change specially shaped seal ring. Screw in slotted round nut as far as previously measured position and turn to mark. Mount fuel distributor with new seal ring and tighten fastening screw to 3.2...3.8 Nm.



↓

Continued on next picture page

Finally, check free travel of sensor-plate control lever; slightly raise sensor plate. There must be a detectable free travel between zero position and point of contact with control plunger. At the center of the sensor plate, this free travel must be between "able to be felt" and 2 mm. If necessary, remove fuel distributor again and adjust slotted round knot accordingly. Note: 0.1 mm at the slotted round nut results in approx. 0.7 mm at the center of the sensor plate.

Return to trouble-shooting chart
B03

TROUBLE-SHOOTING PROGRAM (7)

Testing the injection valves:

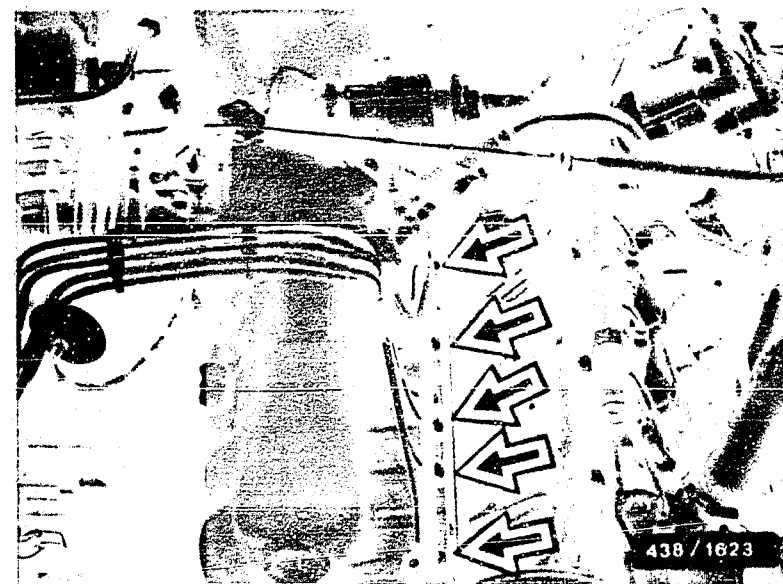
Removing the injection valves:

To do this, loosen both holding rails. Unscrew injection lines. Remove holding rails and withdraw injection valves out of mounting holes.

Do not kink or damage injection lines.

Note: The following test specifications refers to valve testers KDJE-P 400 (formerly KDEP 7452) and 0 681 200 700.

Note specification on test fluid!



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (7) CONTINUED (1)

1. Check for coarse dirt:

Connect injection valve to valve tester and bleed delivery line with union nut open with several actuations of the lever. Tighten union nut.

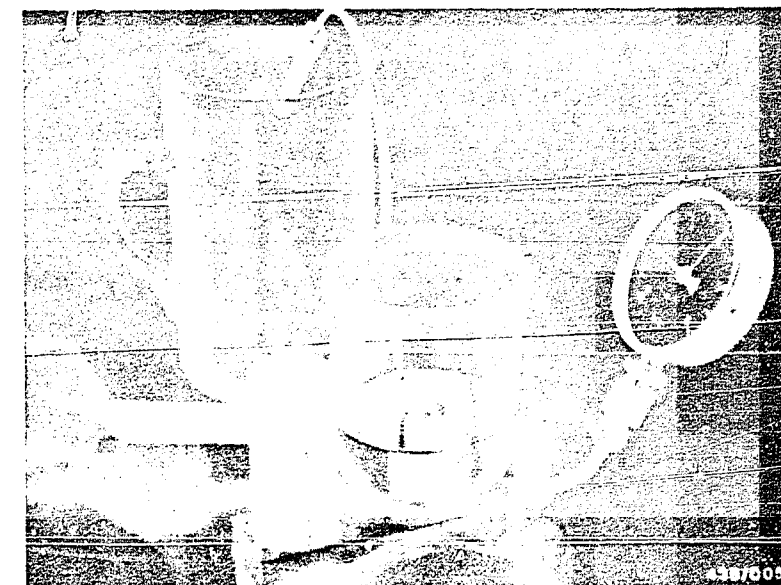
With pressure-gauge shutoff valve open, slowly actuate hand lever (approx. 2 sec./stroke). Pressure must build up to min. 1...1.5 bar gauge pressure.

Pressure buildup obtained?

N>

If there is no pressure buildup, the injection valve is leaking badly (e.g. jammed-in dirt particle).

An attempt can be made by several vigorous actuations of the lever to purge the valve. If this is possible, continue testing. If purging is not possible, discard the injection valve.



2. Checking the opening pressure:

With shutoff valve closed, purge and bleed valve through several actuations of the lever.

Open shutoff valve and check opening pressure while actuating the lever slowly (approx. 2 sec./stroke).

Set value: see vehicle-specific brief instructions.

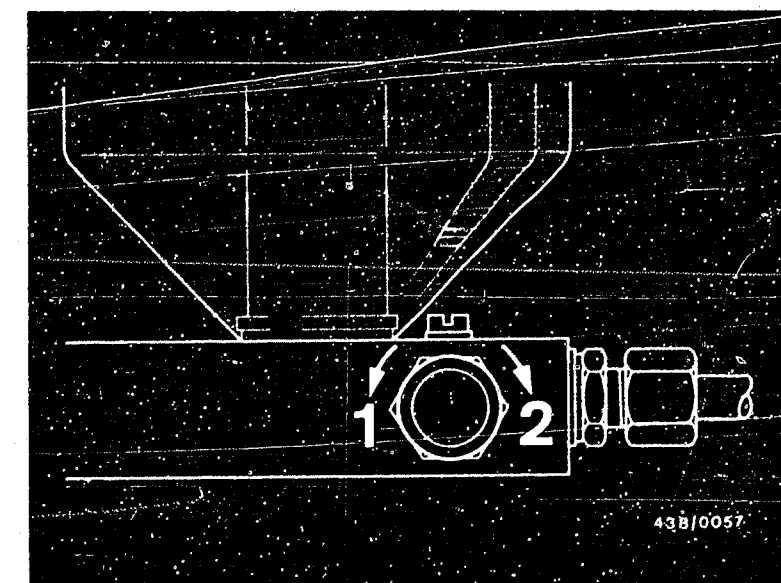
Set value obtained?

N>

If opening pressure not within tolerance, discard injection valve.

It is also possible to replace individual injection valves within in a set.

1 = Open
2 = Closed



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (7) CONTINUED (2)

V

3. Leak test:

Open shutoff valve and slowly raise pressure to 0.5 bar below the measured opening pressure and hold at this level. Within 25 seconds, no drop may form at the valve.

O.K.?

N>

Discard injection valve if leaking.

V

Continued on next picture page

G11

<==>

G12

<==>

TROUBLE-SHOOTING PROGRAM (7) CONTINUED (3)

V
4. Chatter test; chatter
behavior, spray formation

N>

Discard injection valve
if defective.

Shutoff valve closed.
Lever speed approx.
1 sec./stroke. Valve must
chatter audibly. No drop may
form at the mouth of the valve.
There must be no cord spray.
One-sided, atomized spray
formation within a total
spray angle of approx. 35° is
permissible.

See picture examples for
aid to evaluation.

Injection valve O.K.?

Good spray formation -
injection valve O.K.

43810058

One-sided, but good spray
formation -
injection valve O.K.

43810059

V
Continued on next picture page

G13

<==>

G14

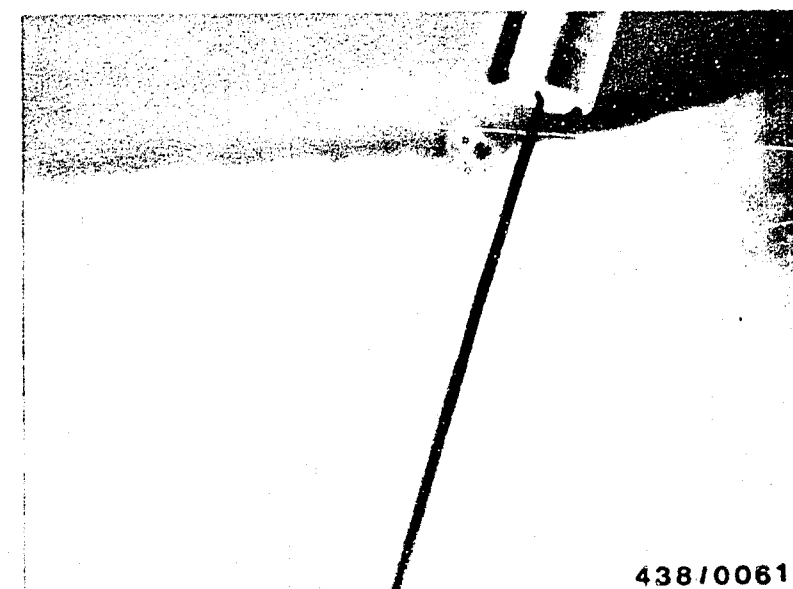
<==>



438/0060

Poor spray formation
(formation of drops)
Discard injection valve

Poor spray formation
(cord spray)
Discard injection valve



438/0061

Continued on next picture page

G15

<=>

G16

<=>

TROUBLE-SHOOTING PROGRAM (7) CONTINUED (5)

V

Re-install injection valves -
always with new seal rings.
Mount holding rails.
Connect injection lines to
the valves and screw down
holding rails. Make sure that
injection lines are laid
free of tension and kinking.

Note: The fuel distributor
has six delivery-line
connections; one is for the
start valve and must not be
mixed up (see picture).

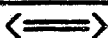
If one or more injection
valves have had to be replaced,
finally check the idle
adjustment and correct if
necessary (Coordinate H11).

Y

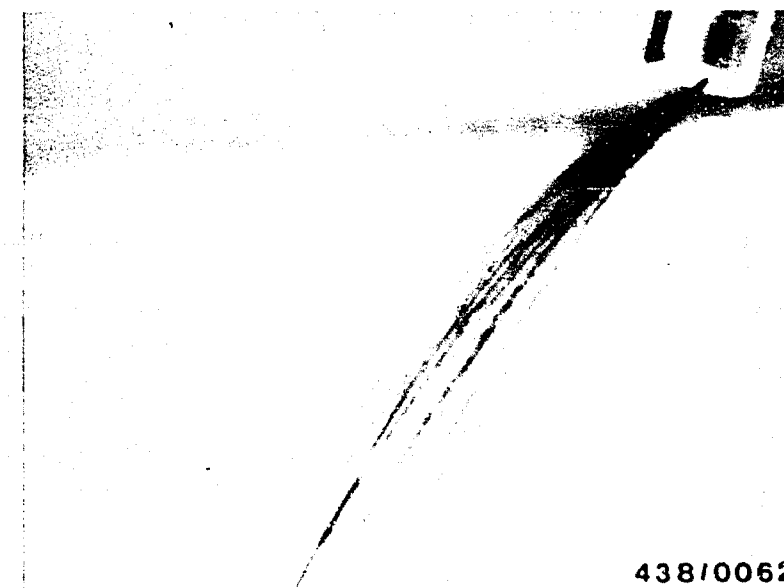
V

Return to trouble-shooting chart
B03

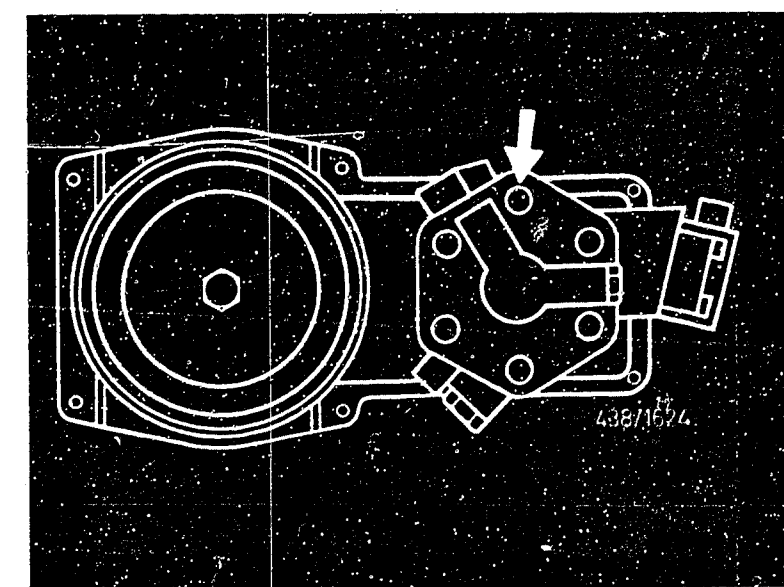
G17



G18



Poor spray formation
(spray in strands)
Discard injection valve



Comparative measurement of deliveries from fuel-distributor outlets:

1. Preparations:

Perform test with tester for delivered-quantity comparison KDJE-P 200 (formerly KDEP 7451).
Necessary accessories:
Adapter line KDJE-P 200/25 and adapter sleeves KDJE-P 200/19.

Testing is performed with the original injection valves of the engine. This makes it possible to check whether any scatter in deliveries is due to the fuel distributor or to the injection valves.

Remove injection valves for testing. To do this, loosen both holding rails, unscrew injection lines, remove holding rail and withdraw injection valves out of the mounting holes.

Do not kink or damage injection lines.



Continued on next picture page

2. Setting up, connection of tester for delivered quantity comparison:

Set up tester next to vehicle (e.g. on tester trolley KDJE-W 100) and align with integral spirit level.

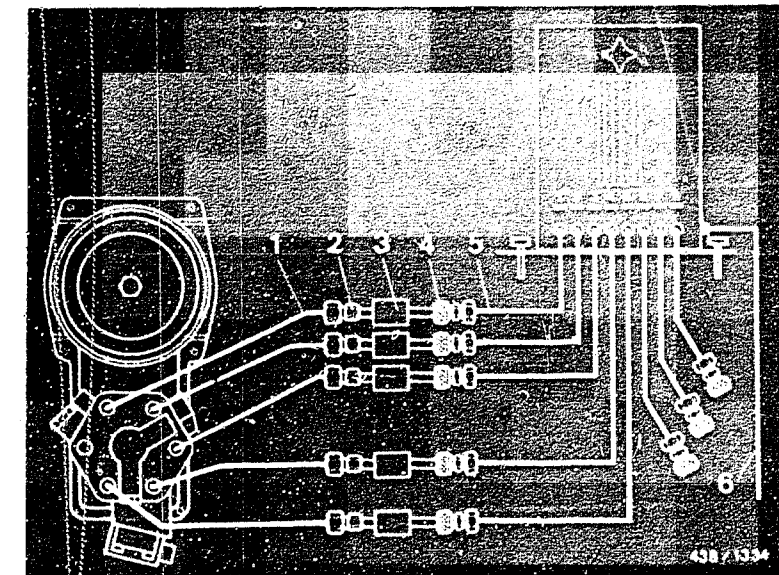
Connect adapter lines KDJE-P 200/25 to the delivery connections of a fuel distributor. The original start valve remains connected.

Connect injection valves to the adapter lines and, using adapter sleeves KDJE-P 200/19, insert as far as they will go into the automatic connectors of the tester lines. Tighten knurled nuts firmly.

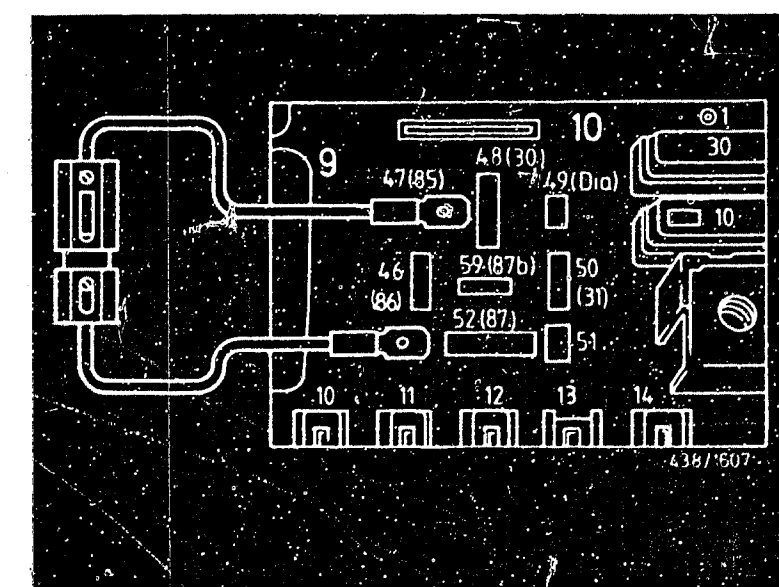
Bleeding the tester:

Switch on electric fuel pump by jumping the safety circuit. Raise air-flow sensor plate as far as it will go. Press buttons of 8-way valve one after the other, switching over 3-way change-over valve repeatedly until both measuring tubes are free of air.

Continued on next picture page



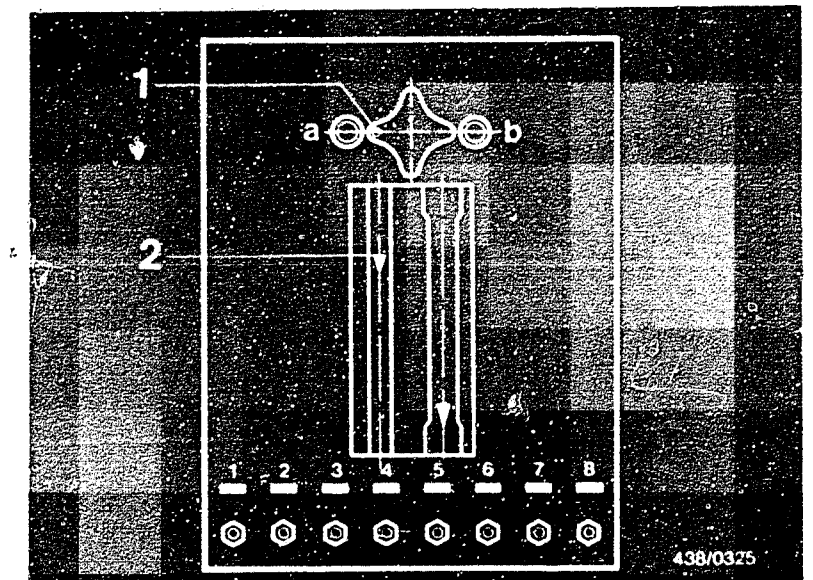
- 1 = Adapter lines
DJE-P 200/25
- 2 = Injection valves
- 3 = Adapter sleeves
KDJE-P 200/19
- 4 = Automatic connector
- 5 = Tester lines
- 6 = Return lines to fuel-
tank filler neck



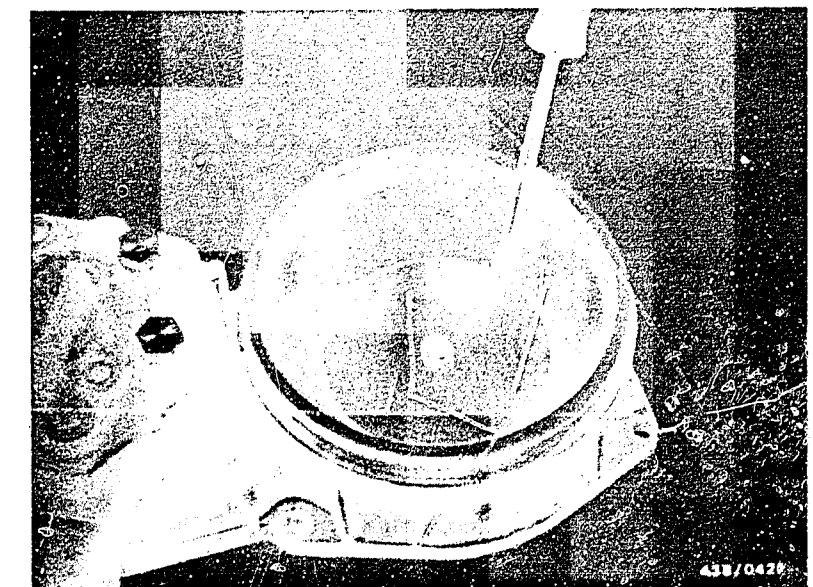
3. Instructions on testing:

Delivered-quantity comparison is performed in the idle, part-load and full-load ranges. Idle measurement with the small measuring tube (white dot on knob to left); part-load and full-load measurements with the large measuring tube (white dot on right). For each measurement, be sure to wait until the float has reached its final position. This may take 20...30 seconds in the case of small deliveries.

Precise adjusting and fixing of the air-flow sensor plate for the various load ranges with a screwdriver (small screwdriver for idle position) which is jammed to the appropriate depth between air funnel and sensor plate.



- 1 = White dot
- 2 = Measuring line
- a = Idle
- b = Part load/full load



Continued on next picture page

4. Testing:

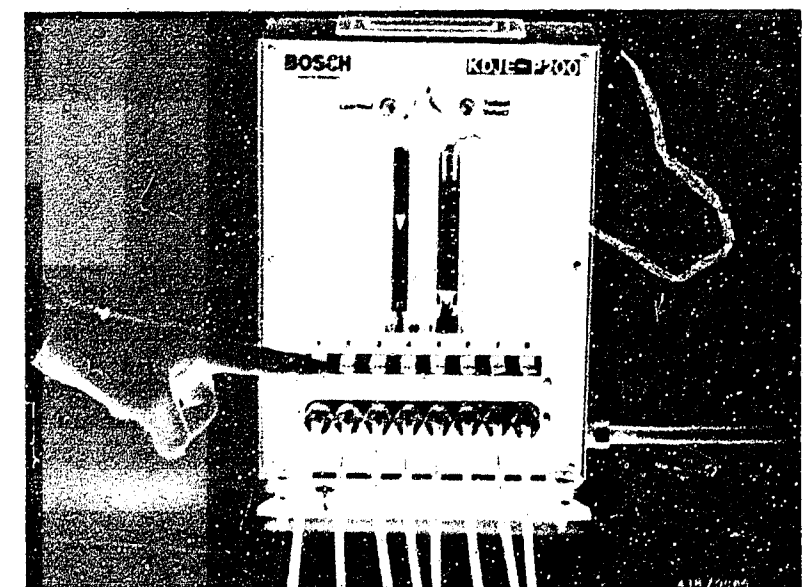
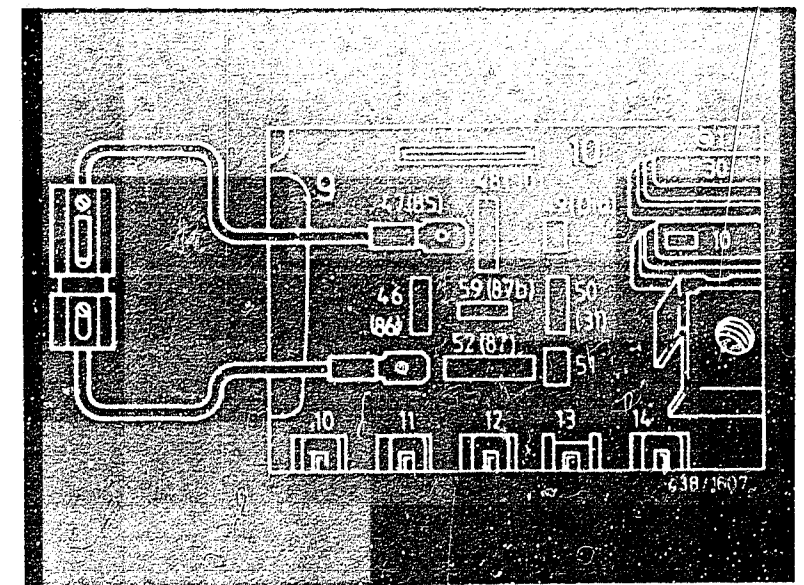
Switch on electric fuel pump by jumping the safety circuit.

Disconnect plug from lambda sensor (take apart) (arrow in center picture).

Set values: see vehicle-specific brief instructions.

The value "setting point" in the test specifications refers always to the fuel-distributor outlet with the smallest delivery, i.e. establish this outlet first of all:

Press button for outlet 1. Deflect air-flow sensor plate until the appropriate measuring tube shows approximately the value "setting point". Check the remaining outlets and establish the outlet with the smallest delivery. Press the button of this outlet again and set delivery precisely to "setting point" by adjusting the position of the sensor plate. One after the other, press the remaining buttons and measure maximum delivery from each outlet (deviations may lie only above the "setting point").



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (8) CONTINUED (4)

Perform test in all three load
ranges as per set values.

Set values obtained?

N>

If two great a deviation is
found in one of the three load
ranges, repeat test as a check.
If the result is confirmed,
check whether the cause lies
in the fuel distributor or
in the injection valves.

To do this, swap round the
injection valves with the
largest and smallest deviations.
If the result remains the same,
the cause is in the fuel
distributor. If the fault
follows the injection valves,
the cause lies with the
injection valves.

Replace defective fuel dis-
tributor or replace defective
injection valves.

Continued on next picture page

5. Checking the minimum delivery from all outlets:

Fully deflect air-flow sensor plate and check delivery from all outlets.

Set value: see vehicle-specific brief instructions.

Is minimum delivery obtained at all outlets?

N>

Replace fuel distributor.

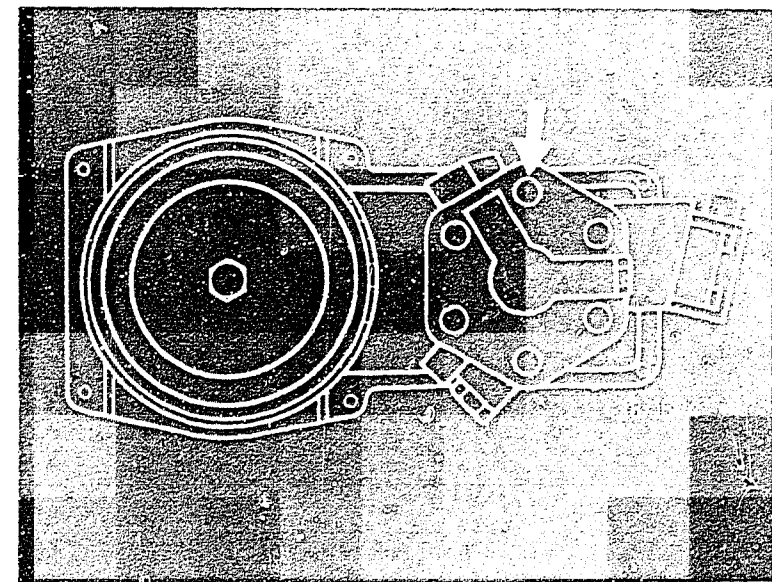
Final operations:

Re-install injection valves - always with new seal rings. Mount holding rails. Connect injection lines to valves and screw down holding rails. Make sure that injection lines are laid free of tension and kinking.

Note: The fuel distributor has six delivery-line connections; one is for the start valve and must not be mixed up (see picture).

Re-connect all electric leads. Mount relay of safety circuit. By a trial run of the engine, check whether all line connections are leak-tight.

Finally, check the idle adjustment and correct if necessary (Coordinate H11).



Return to trouble-shooting chart B03

TROUBLE-SHOOTING PROGRAM (9)



Checking the control-unit functions:

Requirements for testing:

The pressure actuator, temperature sensor (coolant), throttle-valve switches (idle and full-load) and their leads must be O.K.

Connect ammeter to pressure-actuator:

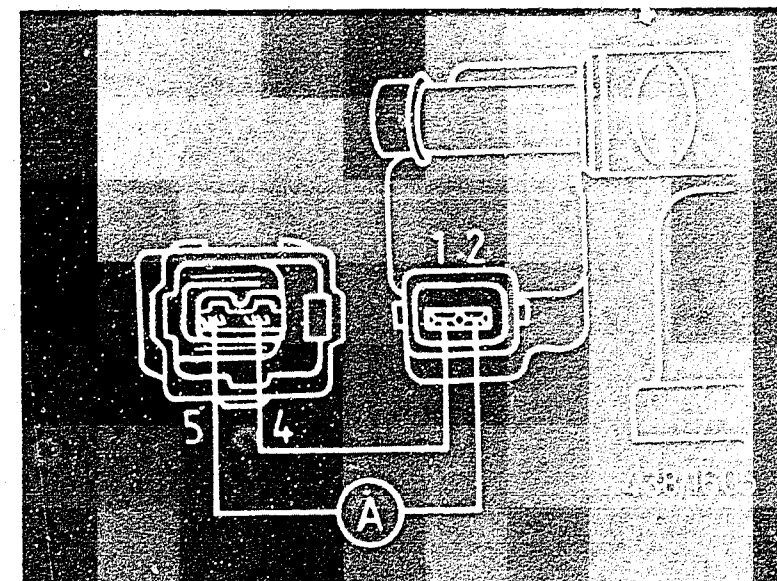
Disconnect plug from pressure actuator. Using test lead, re-connect lead from term. 1 to pressure actuator. Connect ammeter at term. 2 between pressure actuator and plug (test leads KDZS 0004 and KDUM 0008). Set measuring range to 200mA.

For the following measurements, disconnect plug from coolant-temperature sensor (find out which connection is for KE-Jetronic). Connect 2.5 K Ω resistor between plug and vehicle ground (corresponds to engine temperature of +20° C).

Check the following enrichment functions.



Continued on next picture page



TROUBLE-SHOOTING PROGRAM (9) CONTINUED (1)

* Starting enrichment:

Start engine and read off value on ammeter. Current rises only briefly to starting value (approx. 1 sec.).

Set value: see vehicle-specific brief instructions.

Set value obtained?

N>

Control unit defective.

Replace control unit.

Y

* Post-start enrichment:

Operate engine at idle and read off value on ammeter. Current remains constant for a few seconds (approx. 5 sec.).

Set value: see vehicle-specific brief instructions.

Set value obtained?

N>

Control unit defective.

Replace control unit.

Y

Continued on next picture page

TROUBLE-SHOOTING PROGRAM (9) CONTINUED (2)

* Warm-up enrichment:

Operate engine at idle
and read off value on
ammeter after it has settled
after falling from the post-
start-enrichment value.

Set value: see vehicle-
specific brief instructions.

Set value obtained?

N>

Control unit defective.

Replace control unit.

Y

* Acceleration enrichment:

Slowly raise the engine
speed and make reading.

Set value: current reading
must rise.

Set value obtained?

N>

Control unit defective.

Replace control unit.

Y

Continued on next picture page

TROUBLE-SHOOTING PROGRAM (9) CONTINUED (3)

* Full-load enrichment:

Remove resistor between
temperature-sensor plug
and ground.
Let engine run and briefly
raise the engine speed and
make reading.

Set value: see vehicle-
specific brief instructions.

Set value obtained?

N>

Control unit defective.

Replace control unit.

Y

* Overrun cutoff:

Let engine run and raise
engine speed to 3000 min⁻¹.
Then suddenly bring throttle
valve into idle position
and make reading.

Set value: see vehicle-
specific brief instructions.

Set value obtained?

N>

Control unit defective.

Replace control unit.

Y

Return to trouble-shooting chart
B03

V

Idle adjustment:

General information:

Idle speed is not adjustable, is set by idle-speed closed-loop control.

The bypass screw in the throttle-valve assembly is screwed in as far as it will go, sealed with paint and must not be adjusted.

CO testing for adjustment before catalytic converter at test pipe (near intake manifold, arrow).

Conditions for testing:

Engine mechanically O.K.

Ignition system and KE-Jetronic O.K.

Engine at operating temperature (oil temperature approx. 80° C).

Connect tachometer (motor-tester) and CO measuring instrument in accordance with operating instructions.

Y

V

Continued on next picture page



Disconnect hose lines of crankcase insulation from cylinder-head cover and seal off tight.

Disconnect hose line between active-carbon filter and air-guide hood and leave open.

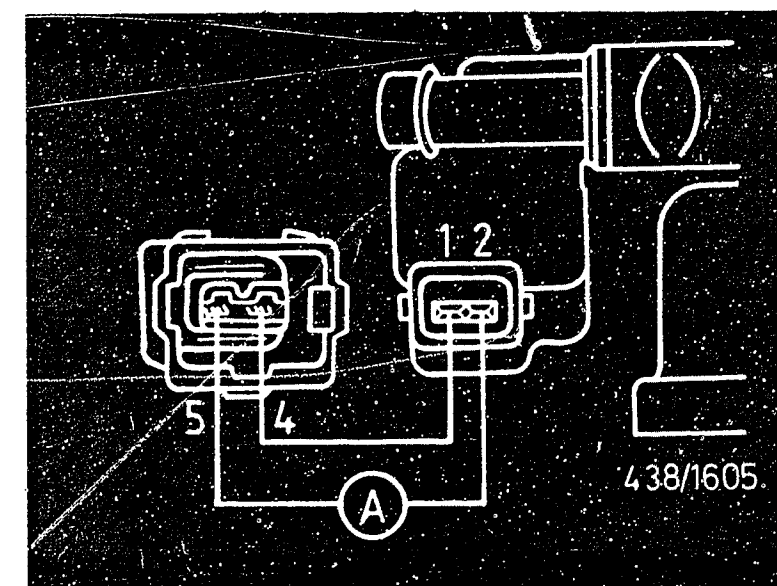
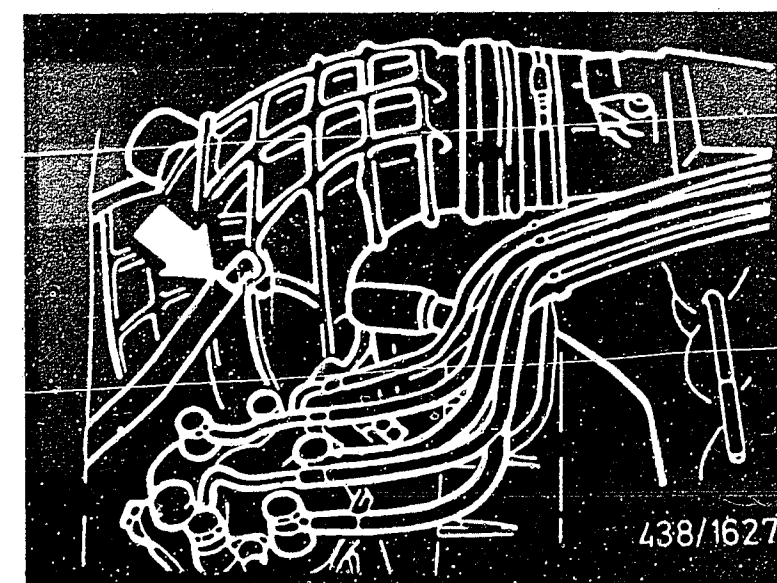
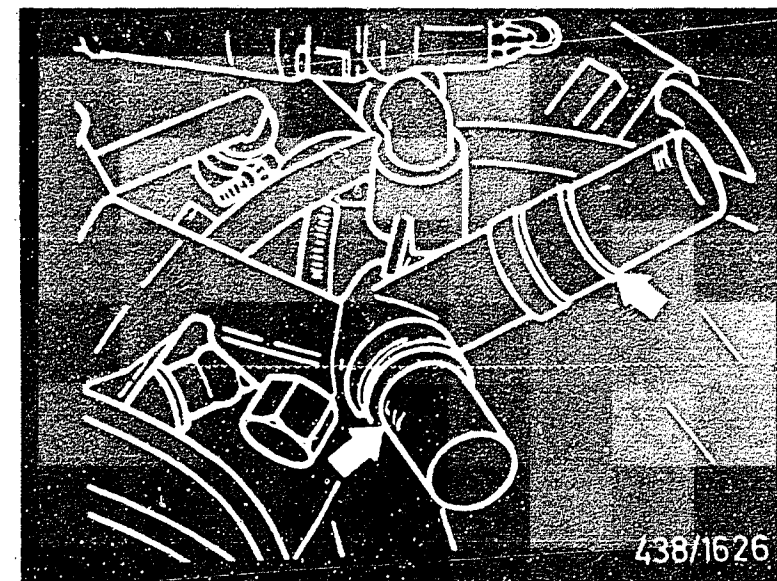
Note: Angle piece must remain in air-guide hood; it has a calibrated bore.

If injection lines have been loosened, bring engine to approx. 3000 min⁻¹ several times before idle adjustment; then allow to operate for at least 2 minutes at idle speed.

Connect ammeter to pressure actuator as follows:

Disconnect plug. Using auxiliary lead, re-connect lead from term. 1; connect ammeter to term. 2 between pressure actuator and plug (test leads KDZS 0004 and KDUM 0008).

Continued on next picture page



Testing:

Operate engine at idle speed.

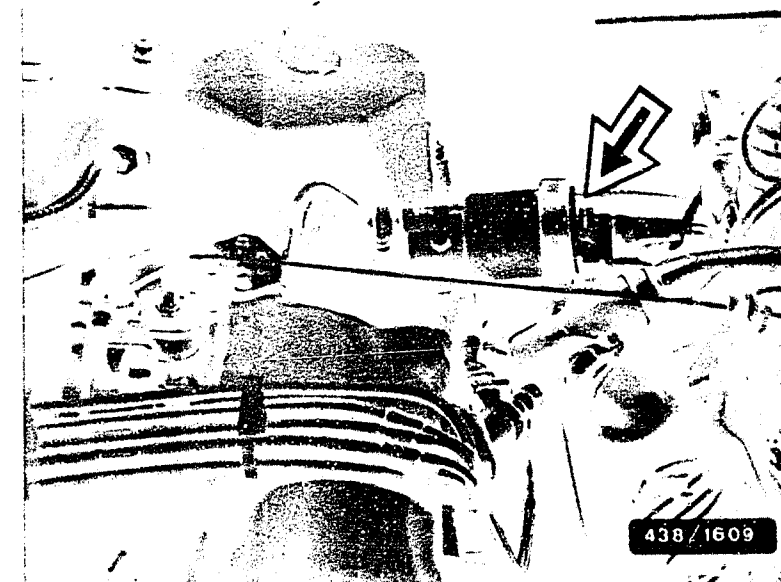
Set value for idle speed: see vehicle-specific brief instructions.

Raise engine speed several times and check whether engine settles again at the measured idle speed.

N>

Perform the following checks until the fault is found:

- * Using screwdriver, knock several times on idle actuator. If there are changes in engine speed: idle actuator stiff. Replace idle actuator.
- * Check whether bypass screw on throttle-valve assembly is screwed in as far as it will go. Screw in if necessary.
- * Measure voltage signal of potentiometer on air-flow sensor at idle speed and – if possible – adjust or replace air-flow sensor. See detailed description in special test step, Coordinate E11.
- * If above checks O.K.: control unit defective. Replace control unit.



Continued on next picture page

Take apart single plug of lambda-sensor lead (green lead, see arrow in top picture).

Remove protective cap from exhaust-gas test pipe and plug on hose line of exhaust-gas analyzer.

Measure exhaust gas at idle speed.

Set value: see vehicle-specific brief instructions.

Set value obtained?

N>

If necessary, correct CO adjustment by turning the idle-mixture-adjusting screw in the mixture-control unit.

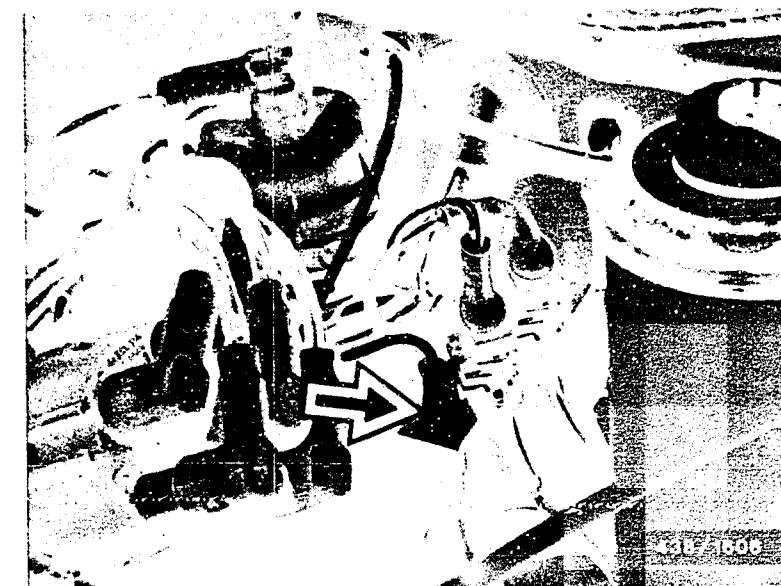
To do this, remove plug in access hole in air-flow sensor using special tool (e.g. with tool set no. 4521 from Hazet):

Using 2.5 mm drill, drill into plug approx. 3.5...4 mm deep (plug has carbide insert in underside). Remove metal chips. Screw in extractor and withdraw plug in an upward direction.

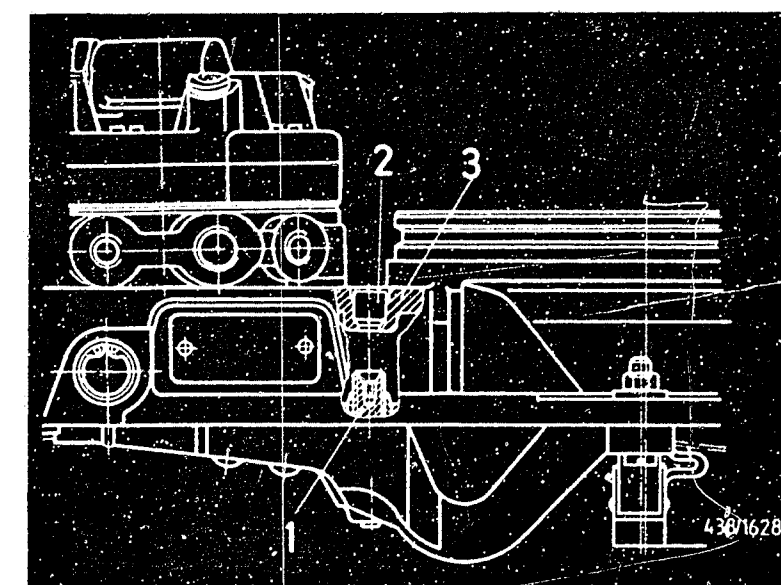
Make CO adjustment with adjusting wrench KDEP 1035. Do not exert any pressure on the wrench. Do not accelerate the engine as long as the wrench is inserted (danger of bending).

Turning clockwise: enrichment.
Turning counterclockwise: leaning.

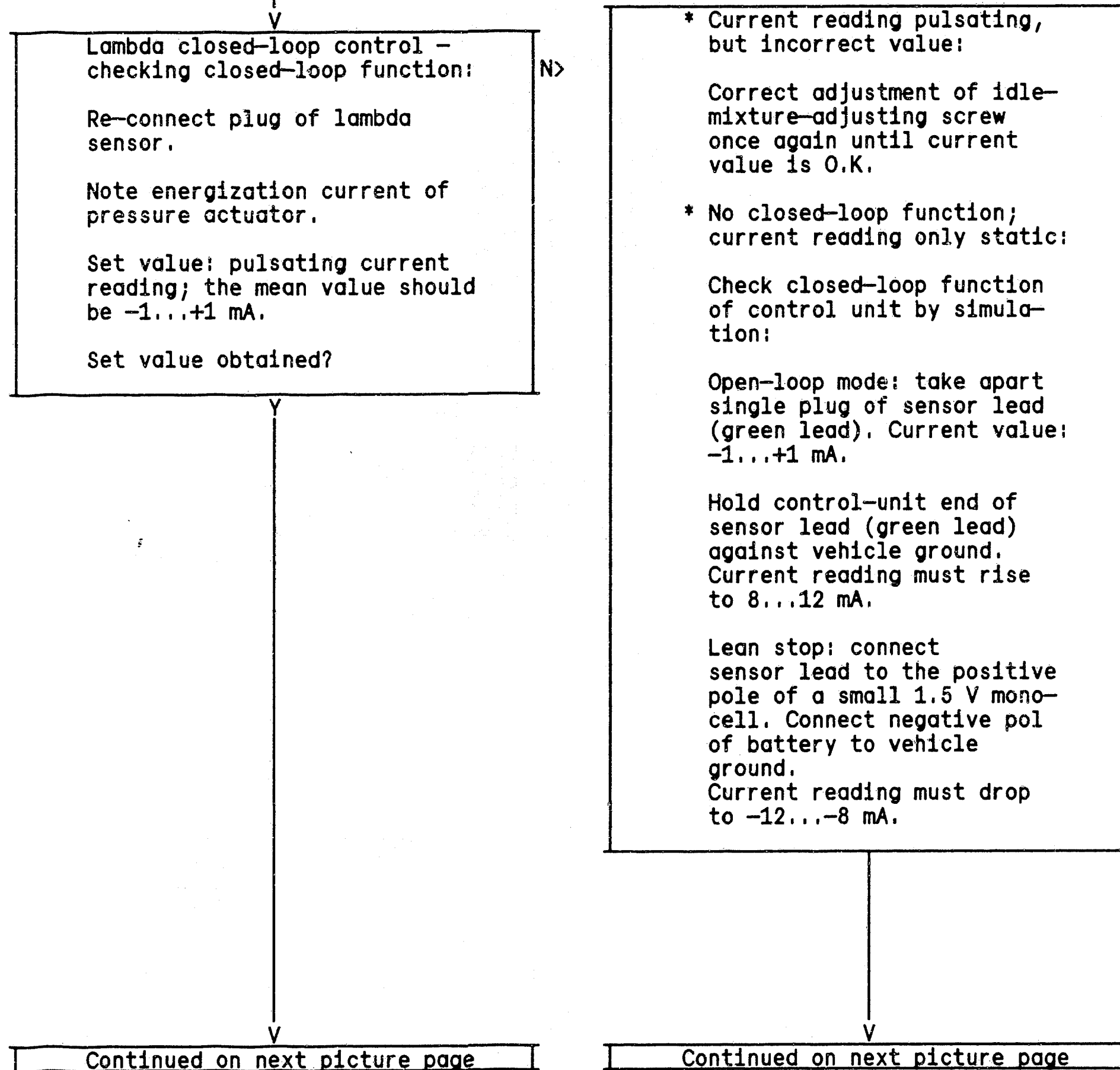
After each adjustment, remove adjusting wrench and briefly accelerate engine.



- 1 = Idle-mixture-adjusting screw
- 2 = Plug
- 3 = Air-flow sensor



Continued on next picture page



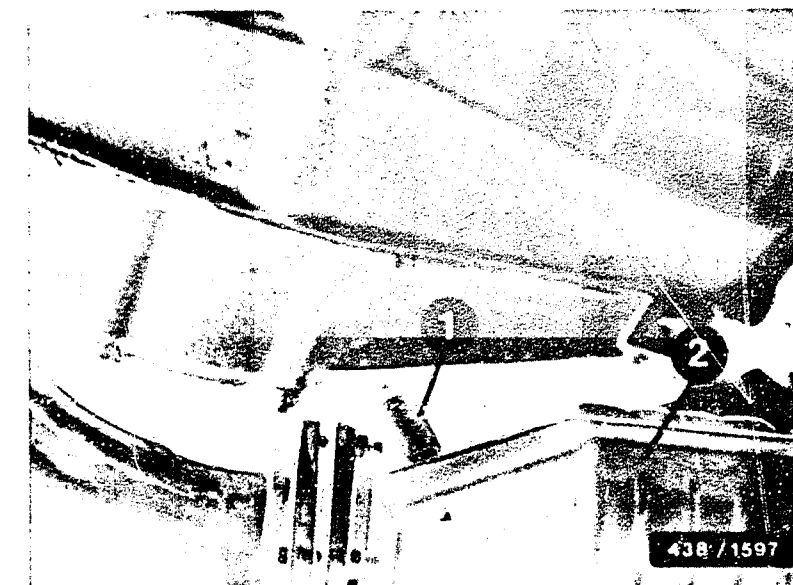
Control-unit functions
not O.K.: replace control
unit.

Control-unit functions
O.K.: lambda-sensor
defective.

Note on installing the lambda
sensor:

Before installing the sensor,
coat its thread with special
mounting paste VS 14 016 Ft
(5 964 080 105). Coat only
the threads; no paste must
get into the slots.

After installing the sensor,
check closed-loop mode
once again. If necessary,
adjust mean value again
(-1...+1 mA).



1 = Lambda sensor
2 = Catalytic converter

Continued on next picture page

TROUBLE-SHOOTING PROGRAM (10) CONTINUED (6)

V

Re-connect hose lines of crank case ventilation and active-carbon filter. Watch CO reading. The CO value must remain within the checking tolerance - see vehicle-specific brief instructions.

N>

A rise in the CO value does not normally point to an incorrect adjustment, but to enrichment from the crank case as a result of thinning of the oil. This is usually a consequence of the vehicle being driven predominantly over short distances.

With a brisk, long trip, the fuel content in the oil will be reduced, and the CO value will become normal again.

In the short term, this effect can also be achieved by changing the oil.

Y

Return to trouble-shooting chart B03

H23

<==>

H24

<==>

TROUBLE-SHOOTING PROGRAM (11)

Checking and adjusting the potentiometer on the air-flow sensor:

Note: This test step is necessary in the case of poor idle/part-load performance.

Disconnect plug from potentiometer. Using auxiliary leads KDZS 0004 and KDUM 0008, re-connect all three contacts of the plug to the potentiometer, so that connection of a voltmeter is possible (note pin assignment in picture).

Operate warmed-up engine at idle speed. Connect voltmeter to term. 1 (+) and 3 (-) and measure supply voltage to potentiometer.

Set value: see vehicle-specific brief instructions.

Note down measured value.

Set value obtained?

N>

* No voltage reading:

Stop engine and disconnect plug from control unit.

Using ohmmeter, check the following leads between both plugs for:

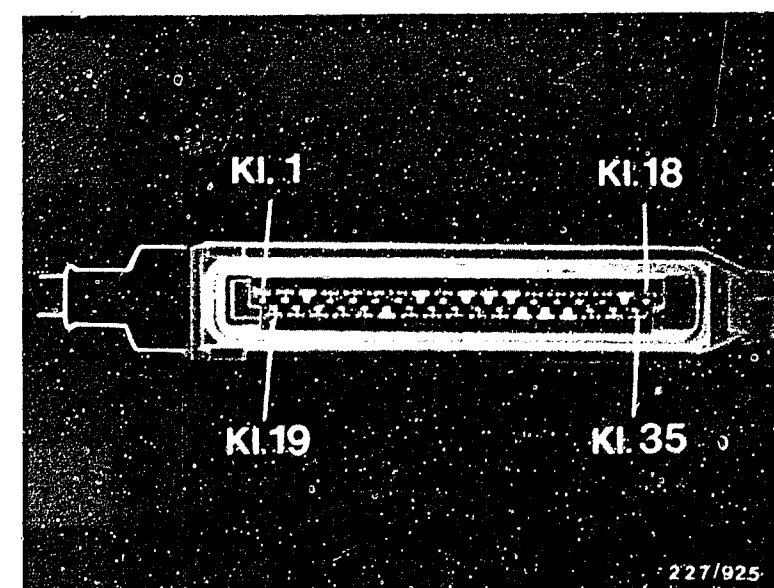
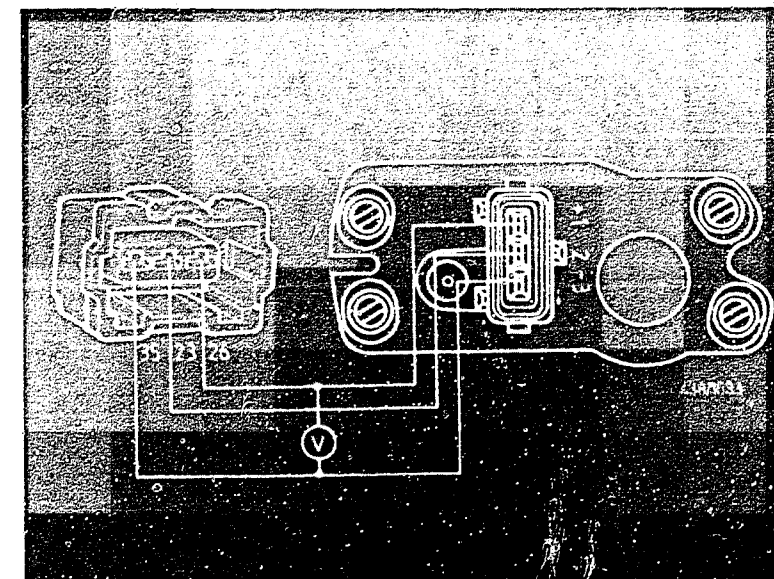
Term. 23, 26 and 35 open circuit.
Set value: approx. 0 Ω .

Term. 23 and 26 short circuit to ground.
Set value: infinity Ω .

Term. 23 and 35 short circuit to positive.
Set value: infinity Ω .

Eliminate any line faults. If there is no line fault, control unit defective. Replace control unit.

* Voltage reading not within tolerance: control unit defective. Replace control unit.



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (11) CONTINUED (1)

Connect voltmeter at term. 2 (+) and 3 (-) of potentiometer and set to 1.5 V measuring range.

Check potentiometer signal at idle speed.

Determine the set value from the curve contained in the test specifications as a function of the previously measured supply voltage.

Set value: see vehicle-specific brief instructions.

Set value obtained?

N>

* No voltage signal:

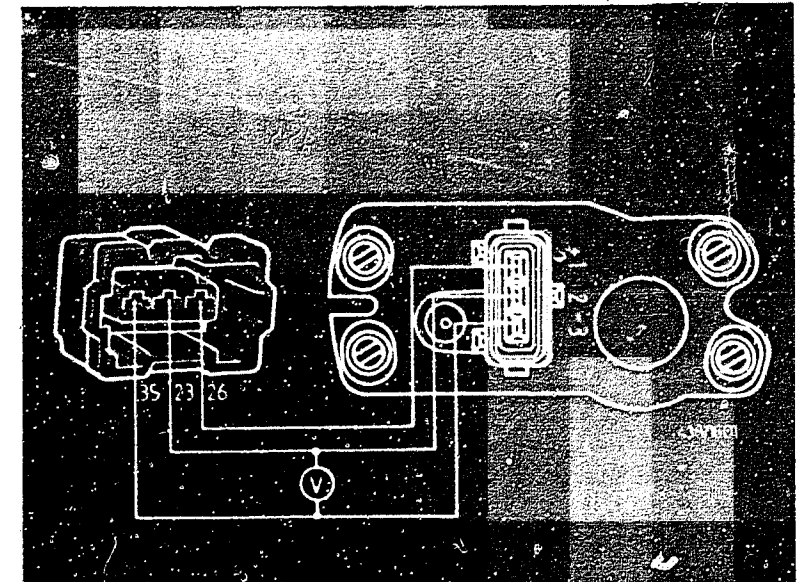
Potentiometer defective. Replace air-flow sensor assembly.

Important: Replacing the potentiometer is not possible with KE 3-Jetronic. The four fastening screws must not be loosened.

* Voltage signal not within tolerance:

In the case of a slight deviation, it is possible to make an adjustment at the small trimming potentiometer (to the right of the edge connector). To do this, remove sealing compound and adjust the trimming potentiometer carefully, delicately with a very small screwdriver. Finally, seal the trimming potentiometer with black sealant (e.g. Terroson).

If adjustment is not possible, replace air-flow sensor assembly.



Return to trouble-shooting chart B03

Continued on next picture page

V

Note the following when replacing the air-flow sensor:

Before removing the fuel distributor, thoroughly clean it in the area of all fuel connections.

Install the air-flow sensor with new flange seal (Audi service part), without sealing compound.

Replace seal between air-flow sensor and fuel distributor.

Tightening torques: Air-flow sensor fastening screw 9...10 Nm, fuel-distributor fastening screws 3,2...3.8 Nm.

Free travel of air-flow sensor plate after mounting of fuel distributor and after any correction to the idle adjustment: "can be felt" to 2 mm at center of sensor plate.

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